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# ETHNOLOGY.—*A visit to Laos, French Indochina.*[1]

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This is a summary report of a trip made in 1948 to little-known Laos in French Indochina as an initial field survey in connection with the writer's appointment to the Southeast Asian Studies program at Yale University. The writer had just finished a period of about one year as cultural officer for the Department of State in Bangkok and Saigon and so had acquired some background context for observation in Laos, a region the culture of which is basically similar to that of Siam and the administration of which is through the French.

Arrangements were made for the trip through M. de la Fournière, head of the Bureau de la Presse et de l'Information in Saigon. Thanks are due to him and to the numerous French and Laotian officials who assisted the writer in his trip through Laos—not only with information, but with generous hospitality as well.

The places visited included North and South Laos and both towns and rural areas. The itinerary was as follows:

Saigon–Vientiane by plane.
Vientiane–Xieng Khouang–Luang Prabang–Vientiane by Piper Cub provided by the French Conseiller for Laos.
Vientiane–Suvanakhet by plane.
Suvanakhet–Pakse by convoy.
Pakse–Saigon by courier plane.

January is a good time to travel in Laos because it is in the middle of the dry season. Therefore roads and mountain trails are all open, and one can reach almost any desired point by horseback. The weather is clear and cold in most regions with occasional frosts in the mountain areas such as Xieng Khouang and Pakson (near Pakse). The lack of rain gives the countryside a dry brown look which is replaced by lush green in the rainy season. The beauty of the forests in the north is enhanced in late January by the pink of blossoming cherry trees.

[1] Received February 28, 1949.

## VIENTIANE

Vientiane is the principal town of northern Laos. It is located on the Mekong and is the seat of the French Government, with the Conseiller's mansion overlooking the river and Siam on the other side. (The French administration in Laos is technically advisory to a Laotian administration. Each district capital has its Laotian administrator and its French conseiller. Each such town also has a garrison of French and Laotian troops. Most transport facilities, planes, etc., are in French hands.)

Like all towns of Indochina, there is in Vientiane a central market to which people from the countryside bring garden produce for sale in the mornings and which gradually closes down by noon. This market is more colorful than those in Vietnam owing to the silk and brocaded skirts worn by the Laotian women and their characteristic off-center chignons often decorated with solid gold pins and circlets.

The shopping street of Vientiane is not more than a couple of blocks long. As might be expected, many of the shopkeepers are Chinese. The shops include a number of American and British goods including toilet articles (soap, toothpaste), ink, etc. These goods come in from Siam across the Mekong in exchange for raw materials from Laos. The exchange rate is said to be 1 tical for 2 to 3 piastres.

The French maintain an information hall across from the market place, and this is staffed by a French chief and a Laotian chief and a staff of three or four Laotians. They issue a mimeographed news sheet in Laotian every few days and publish a more ambitious journal every month or so. A newspaper reading room and photo-display hall take up the main floor, while offices of the staff occupy the upstairs.

The chief justice of the tribunal in Vientiane, Mr. Ourot, is a Laotian and also a French citizen. He was the delegate of Laos to the Asian Conference in New Delhi in 1947. His cousin, Ouneua, works in the Maison d'Information, speaks good French, and assisted the writer in his visits to villages and temples in and around Vientiane.

The most impressive feature about Vientiane—and all of northern Laos visited by the writer—is the friendliness of the relations between the French and the Laotians. This is in very marked contrast to the picture in either Saigon or Hanoi. Ouneua made an interesting remark in this connection: "Before the war the French did little for Laos (they had always favored Annam), but during the war we were faithful to France and now she is doing much for us." There is little doubt that Laos feels she has a good deal to gain from French protection. Laotians are afraid of Siam's expansionist designs from bitter experience and they also fear Vietnamese domination. Being a region of sparse population, they are in no condition to fend off either pressure unaided.

Until recently, there was an Annamese[2] community in Vientiane which supplied the local market with vegetables and some services. (The Laotians produce chiefly for home consumption, not for sale; the Annamese—from the French point of view at least—served a useful function by providing market goods and services.) But when the Vietnamese took over after the Japanese and then the French defeated them in this region, most of the Annamese crossed the river into Siam. Their deserted truck farms can still be seen in the vicinity of Vientiane.

Visits were made to two Laotian villages. These are strung along the river almost continuously and are to be found more sparsely inland. They consist of groups of bamboo-walled, thatch-roofed dwellings set up 6 or 8 feet from the ground on solid wood piles. Each homestead includes a plot of household land, a barn, a rice granary, also set up off the ground, a chicken coop (bamboo), a fine loom for weaving silk skirt materials and, by the river, a small vegetable plot on the riverbank as well as in the house yard. Each family has one or more rice fields some distance from the house. Many villages have a blacksmith who works at a forge, the heat of which is maintained by bamboo piston bellows. Each village has a headman who handles relations with the government. He seems to work without recompense but this is not certain.

On the occasion of feasts for various occasions, the neighborhood women foregather to prepare the necessary food. The cooking fires for such communal eating are laid in pits dug in the earth in such a way that the broad-beamed pot may be laid over a hole which has a short trench leading to it for draught.

The beautiful weaving of the area is done by the women; every young woman learns the art and makes her own materials. The silks are dyed at home, and it is common to see stained hands, especially indigo stained ones, in the village. Dyes other than blue and brown are purchased from Chinese—bright reds, oranges, etc. The decorative 6- to 8-inch bands at top and bottom of the skirts are woven separately and then sewn on the main skirt material. The bands usually include designs in silver and gold thread. A good skirt is valued at 400 to 700 piastres, and the remarkable thing about Vientiane and other places in northern Laos is the fact that every woman has a number of these fine garments and wears one daily to market—or even about the house.

A great deal of gold jewelry is also worn. This is said to be a form of investment, but it is also most decorative set in the black chignon of a Laotian lady or as earrings, necklace or bracelet.

[2] In this report the term Annamese is used to refer to the prewar settlers in Laos in contrast to the term Vietnamese, used to refer to the politically conscious members of the new state of Vietnam made up of the former coastal states of Tonkin, Annam, and Cochinchina.

Some of the implements of the village are fundamentally of the same pattern as found throughout East Asia, as, for example, the foot-powered rice pounder and the broad round iron cooking pot.

One enters a farmhouse by bamboo ladder or steep wood stairs and comes into a room with a wood floor and with bamboo mat covering here and there. If one has footgear, it is usually removed before walking around. People sit on the floor or on low round bamboo stools which look rather like inverted baskets.

Many houses have a wooden chair or two which may be brought out for city guests. There is usually a stone fire grate somewhere in the main room where light cooking is done. This is in addition to outdoor fire places.

People in villages are friendly to visiting strangers but unless specifically approached make little effort to inquire of them who they are or why they are there. They neither crowd around one nor run away. This take-it-or-leave-it attitude is said to be characteristic of the area. Nor is there much of a tendency toward hierarchy in the villages. Visitors of various ranks are treated equally. This is reported to be in contrast to Vietnam where rank is most important, and where strangers are suspect until explained.

Another contrast to Vietnam is that special artisans do not seem to be characteristic of Laos. In each family the basic needs are supplied: food, clothing, drink. Ironworking is a specialty and so is silverworking and goldworking. But in the towns of Laos it is the Chinese and Annamites who supply the special services and manage the shops. The French often complain that the Laotian makes a poor worker because he does not care to work after he has supplied his needs or acquired enough money to buy the few things he wants to purchase. For this reason, houseboys and clerks in French households and government offices were often Annamites. Since the war, however, a definite effort is being made by the French to train Laotians for government work at all levels so that there need be no dependency on Annamites. The difficulties are threefold: that Laotians speak only Laotian; that they are as a whole untrained for government administrative desk work, and that many are not especially anxious to take it on in the industrious, conscientious way of the Annamite. The whole picture is somewhat reminiscent of the easygoing way of government action in Siam and the French find it difficult to have to let such a system operate in their domain. However, they are beginning to do so of political necessity.

In the villages no one speaks French, and in the town of Vientiane many do not do so either. English is practically unknown. Most villagers are also illiterate in both French and Laotian. On the other hand there are schools in Vientiane, and both French and Laotian authorities are encouraging parents to send their children to school.

Vientiane is a center of Buddhist study, with many monks and a Buddhist Institute, which publishes Buddhist texts, historical documents, and some secular folk material, such as songs and stories. Most of the *wats* have their tales of Siamese plundering. It was from Wat Phra Keo that the Siamese stole the "Emerald" Buddha now in Wat Phra Keo in Bangkok.

The French Conseiller of Laos has a Laotian wife and children, but the wife does not participate as hostess at dinner parties. It is possible that this is because she does not wish to, since the Conseiller's dinner parties are mostly of male officials, both local and visiting, and because he has a good staff of servants and may not care to mix his official activity with his private home life. However, it is interesting that during my stay as a guest in his house I was never introduced to his wife.

Despite the remoteness of Vientiane from Saigon, let alone Paris, the Conseiller and his various confrères make a point of maintaining French cultural standards. Every evening the men dress in white suits with ties and coats. All the amenities of French social life are preserved—intelligent conversation, "politesse," well-cooked food properly served, after-dinner coffee and liqueurs.

Vientiane has no centers of entertainment such as cafes, dance halls, and movies (at least I did not see any). It is definitely a country town despite its importance as an administrative center for Laos. The shops also are small, and none carries a very large supply or variety of goods.

XIENG KHOUANG

The French Conseiller kindly arranged for me to be flown by his Piper Cub to Xieng Khouang, the capital town of Tranninh, a high plateau and mountain area northeast of Vientiane. It is about an hour's flight over high mountains. Looking down from the plane, one sees here and there at widely separated intervals a small clearing in the forest and half a dozen or so thatched roofs, a village of one of the mountain peoples. Otherwise the mountains are densely forested and intersected by streams which feed the exaggeratedly meandering streams of the plains which in turn feed the Mekong, mother of rivers.

The pilot of the plane was a ruddy-faced Corsican, one of a large number of men from that island in Indochina. And he knew many of the Corsicans of Saigon, such as Rosselli, the manager of the Continental Palace. The numerous Corsicans in Indochina maintain a considerable degree of ethnic solidarity.

The Tranninh plateau is a high region surrounded by mountains and is reminiscent of regions in Wyoming or Colorado. The air is cool, often cold, and the days bright once the morning mists have lifted.

At the small airfield a few Laotian soldiers and a French officer are stationed. A Junker on the field had just brought up Saikham, the Laotian district chief of Tranninh from Vientiane.

In Xieng Khouang is the French Conseiller for the Laotian administrator (Saikham) and the Meo chief (Touby). The French conseiller is a Free Frenchman whose previous post for many years was Africa. This is not unusual in Indochina, where the old Vichy personnel has been largely replaced by De Gaulle men—and most of these early administration adherents were in Africa. He chafes a bit under the French indirect rule operating in Xieng Khouang, since he feels he could administer better directly. It is possible that the African background of many French officials in Indochina may be the cause of some of the administrative difficulties and clashes of temperament in Vietnam. In Xieng Khouang, however, M. Pazat seemed to be doing well and his relations with the ranking Laotian and Meo chiefs appeared to be good.

Tranninh is a really remote region—away from all big centers, isolated by mountains, and lacking rich natural resources to attract foreign exploiters. Nevertheless, it has had a troubled history and has been invaded in the past few hundred years by Chinese, by Annamese, and by Siamese. The Siamese invasion of 1892 seems to have been especially terrible, the Siamese taking off thousands of Laotians to Siam as slaves, killing others and generally pillaging the country. During the last war, the Japanese came in, then the Vietminh. And yet today the villages look as if they had rested undisturbed for centuries.

There is also evidence of earlier cultures in the area in the form of stone monuments, in particular a series of great stone funeral urns, 4 to 5 feet high with sides 5 to 6 inches thick, hewn from solid rock and placed in rough order along a ridge around a large crematorium set in a partially natural cave with a hole in the top for draught.[3]

Today the peoples of the district include three principal groups: the Laotian in the plains, the Kha or Phuteng in the hills, and the Meo high in the mountains. This altitude distribution of the three groups seems to be fairly consistent in this area of Laos. In Xieng Khouang, there are also some Chinese, some Tonkinese and a very few French. (Not counting a small military establishment). The Tonkinese still in Xieng Khouang are mostly second and third generation in the district. One or two settlements of Annamites who were mostly Vietminh have been evacuated and Meo who have come down from the mountains are now settled in their houses.

Xieng Khouang is a little country district town with the houses and offices of the French resident, the Laotian administrator and a military garrison. There are a few shops and a small central market, which has mainly edibles for sale each morning. A few manufactured items are sold by Chinese. The food products sold by Laotians and Meo

[3] These are fully described by Mlle. Colani in her publication *Megalithes du Haut Laos*, Paris, 1935.

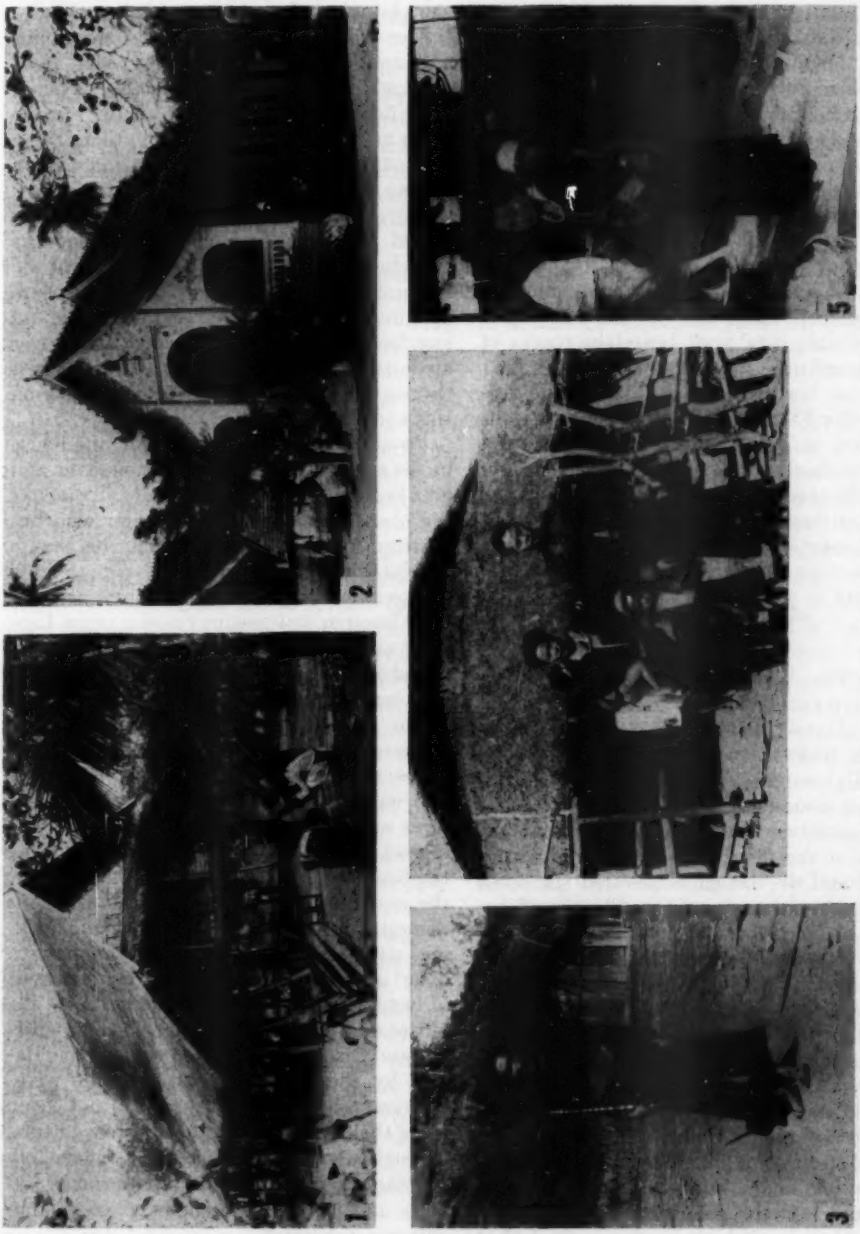


FIG. 1.—Mountain Laos (or Kha?) house, a day's journey from Luang Prabang. FIG. 2.—Buddhist wat, or temple, in northern Laos. FIG. 3.—Meo with home-made gun. FIG. 4.—Meo family. FIG. 5.—A Meo woman at market in Xieng Khouang. She wears a characteristic silver necklace and carries grandchild in Meo style. Laotian woman with typical chignon in background.

are brought to market by women on carrying poles (Laotian) and on baskets carried on the back (Meo). The ladies set their small stocks down in front of them and stand behind them till a purchaser comes to buy—after an hour or so most perishables are sold. No handicrafts such as basketry or woven materials are for sale in this rural market—only local vegetables and animal produce (chickens, ducks, meat) and the manufactured imported items of Chinese, such as flashlight batteries (U.S., dated 1945), shirts, socks, soap, and matches (Siamese and Chinese makes).

Even this rural spot bears the marks of French culture—a stretch of road with neat curbstone border, a few European-style residences for French officials past and present.

Travel in Tranninh is almost exclusively by horseback. I saw only two jeeps in Xieng Khouang except for a convoy of trucks which arrived during my stay. By means of horses supplied by M. Pazat the writer was able to visit Meo, Kha, and Laotian communities.

### THE MEO

The Meo, a type of Chinese mountaineer, make a point of the fact that a straight line is the shortest distance between two points by long trails to and between villages which go straight up and down mountain sides, instead of around or zigzag. This makes horse travel an adventure, but the small mountain ponies of the district are remarkably surefooted and the danger is not that the horse will slip but that the rider will slide off his back as he picks his way down a steep incline.

The Japanese made a serious error in their treatment of the Meo as an inferior people. As a result, the Meo disliked them and aided the French to fight them and also to drive out the Vietminh from Xieng Khouang after the war.

The Meo are most hospitable. When visitors ride up, they come out of the houses, some—of either sex and any age—take the reins of one's horse and lead it off to rest and food, others invite one in for a visit. Some houses have a few chairs for visitors, but most people squat on a small block of wood set on the ground near the fire. Tea is served to visitors, and then food. The food has much more meat in it than that of the average plains people—chicken, beef, pork.

Meo villages are high in the mountains and consist of a few thatch-roofed wood planked houses set square on the ground. The flooring is leveled-off earth. Inside these huts it is dark and smoky, there being a constant fire in a firepit in the main room and no windows other than one or two doors. The yard has dogs and numerous black-haired pigs and some chickens. The dogs and chickens are free to go in and out of the house, but the pigs are kept out. The dogs are literal scavengers. Whatever is left of any food is thrown to them and they hover anxiously for the next item. Old tea is just thrown on the floor. The family walks on this earth floor barefoot.

Provision is made for a spirit of the house in the form of paper, with bits of silver and gold leaf on it pasted on the wall. Travelers are blessed by the village sorcerer who ties a string about one's wrist while he chants and others come and touch one's arm to draw out evil influences. (This custom is basically Laotian and one may notice more Laotians and many French in Laos with bits of old string tied about the wrist for safety. The writer wore one himself for a while.[4]

The Meo are polygamous, it being fairly common for a man to have two or three wives; even young men of 25 or so may have two wives. On the basis of local observations and visits I think it possible that the second wife is often married about the time the first one is having her first child. Thus the second wife can relieve the first of various domestic duties, which include cooking, looking after family agriculture (Meo have a little) and, of course, looking after the needs of her husband. The one family where the writer met both wives seemed to be a happy one and this was attested to without solicitation by the husband's cousin. The wives are not sisters and often are not even from the same district. But Meo culture, throughout Tranninh at least, is remarkably constant despite the wide separation of villages and the existence of peoples of other cultures in between.

[4] Cf., description of similar custom in Siam in Landon's *Southeast Asia: Crossroads of Religion*, p. 31.

The Meo grow opium poppies. Some opium is consumed by them, often in the form of chewing the dried buttons. Supposedly the production of opium is controlled by the French authorities, but both they and others are of the opinion that much illicit trade in opium also takes place. Some of this, doubtless, goes to Siam in payment for manufactured goods from England and the United States. Bangkok and Hong Kong seem to be ultimate trade centers.

The chief of the Meo, Touby, and his family have acquired a knowledge of French and one of them also speaks English. (He has studied in Hanoi and Saigon). Touby, who lives in Xieng Khouang, not on the mountain tops, is anxious to encourage education among his people and he not only urges children to go to school, but encourages night study in his own home where he provides light and books. He is himself anxious to acquire more knowledge of the world. He feels that until the Meo know French they will be neglected. Undoubtedly, if men like Touby develop among the Meo, these people may become important political leaders in Laos in the future. There is little evidence of the Laotians making similar efforts. Touby himself is the French recognized representative of Meo affairs today.

### LAOTIANS

Visits were also made to Laotian and Kha communities near Xieng Khouang. The Laotians of Tranninh wear the characteristic Laotian dress and men often wear the panung. The local female head dress of off-center chignon is universal, there being no permanent waves or bobbed hair as seen in Vientiane. The language is, of course, Laotian. None the less, they have a number of mountain traits; the diet is influenced toward more meat than in the river valley areas. They are said to drink a great deal and the chewing of betel is fairly prevalent. In general theirs is an upland variety of the basic Laotian culture.

### KHA

The Kha and Phuteng are a mountain people said to be like the Moi, basically Malayan in type. However, the Kha the writer saw were pretty much like Laotians except for a few individuals in one village who looked somewhat Negroid. The term Kha is used very loosely and seems to refer to any peoples in the mountain living at a primitive level who are not distinctly Meo in type (the term Kha is said to be resented as indicating savage or uncivilized; Phuteng is more acceptable). The clothing is Laotian, and so are the houses. They do have one notable cultural trait, drinking from the jar. The jar is filled with ashes and into this is poured rice liquor from a bamboo container. Then a series of thin bamboo sticks is placed in it through which one sucks up the liquor which is strained through the ashes. Girls act as hostesses and exchange drinks with one out of the same "straw".

Tranninh and other high regions of Indochina are centers of malaria and it is said to be the commonest disease of the area. Yaws is also common. And I noticed that many people, both French and Laotian, had the sniffles from the cold. It becomes very chilly at night and only warms up about mid-morning—then by afternoon it is so warm one sheds coat and sweater. The Laotians wear various home woven shawls in the morning and lay them aside in the afternoon.

### LUANG PRABANG

After Xieng Khouang, the writer visited Luang Prabang, the royal capital. This is a sleepy, rundown little town with a single row of shops and dozens of temples (wats) in various degrees of disrepair. (Xieng Khouang had practically no wats, though at one time in history they are said to have had many.)

The king's residence is in Luang Prabang and a number of princely families live there. Like Vientiane, it is on the River Mekong. The French have a Counseiller du Roi here who resides in the Maison de France. The Sureté has a staff including two Frenchmen.

There is no electricity in Luang Prabang, since the powerhouse is still unrepaired since the war. Like all towns evacuated by the Chinese occupation forces, Luang Prabang was pretty well stripped. (Pakse also suffered badly in this regard.)

As in Vientiane, Luang Prabang has desolate areas once occupied by Tonkinese who were a part of Vietminh. In Luang Prabang

their houses have been destroyed. It is possible that the general evacuation of the Tonkinese from Luang Prabang accounts in part for its rundown appearance.

Many old historic wats are to be found in Luang Prabang and the town has sentimental values as the royal capital. But in general appearance it is less impressive than Vientiane. There is no electricity in this city and practically no motor transport. Some of the few army vehicles still have U.S. Army written on each side.

The countryside is settled by Laotians in villages. In the mountains are to be found Phuteng and Meo in the same arrangement as in Tranninh—only more distant from the town because of the wide expanse of lowland.

I visited one of the allegedly Phuteng areas on horseback, but as in Tranninh it turned out to be basically Laotian. It was also peculiar in having no musical instruments in it—every proper Laotian village has the bamboo flute (khene), and in offering no hospitality. This was in marked contrast to the "Phuteng" village visited in Tranninh.

## SOUTHERN LAOS

From Luang Prabang I returned to Vientiane and then went on to Suvanakhet. This is a town on the Mekong with a heavy contingent of military including trucks and jeeps. It has a distinctly urban aspect in contrast to Luang Prabang and Vientane with many shops and even a couple of European-style restaurants. More girls had their hair waved.

The head of the Sureté here however is Laotian and a very pleasant individual who provided the hospitality of his house. Wats are less in evidence in Suvanakhet than in Luang Prabang or Vientiane.

A convoy was taken from Suvanakhet to Pakse. It began as three open trucks, but one broke down so we ended with two. Each had a fair complement of armed soldiers, both French and Laotian. Here in the south of Laos things are not so relaxed and peaceful as in northern Laos. Similarly, one could not ride through the forest with the same ease as in the Tranninh and Luang Prabang areas.

The countryside is more or less level, lightly forested and with here and there a rather poor village. The people one sees are poorly dressed in contrast to the Lao and Meo people, especially women, wearing well made and culturally distinct clothing on the public roads of Tranninh.

Pakse turned out to be another Suvanakhet, only more so. More Chinese shops, more French army, more restaurants and even a house of prostitution and an opium den. The town Laotians wear European clothes or rather poor quality skirts—silver-colored thread instead of thread of silver in the brocades. Bobbed hair and permanent waves are almost universal among the young women. Pakse is "acculturated" by contrast with Vientiane.

There are a large number of Annamites in Pakse and one large community on the far side of the river.

The shops contain a wide variety of English and American goods, including items rare in Saigon; e.g., safety razors and razor blades. The prices for manufactured articles are not especially high. (In Tranninh imported goods such as thread are said to be exorbitant.) Presumably many of these goods find their way here from Siam.

On the whole, the impression one gains from a trip to Laos after residence in Saigon and Siam and Hanoi is one of peacefulness and harmonious relations between French and Laotians. This is especially true in the North, where Laotian culture is also strongest. In the south, Chinese and Annamites exist in larger numbers and Vietminh activity also seems to exist. One sees more French military. The small towns are more urban and commercial in a Western sense.

Laos is an area of a wide variety of peoples especially in the mountain areas and in the north, each with its own distinctive language and culture. The minority problem spoken of by the French is a real one. The Meo may well become a progressive and politically important minority group in Laos in a generation.

The people of Laos, French and Laotian alike, take pride in the country, the people, and the culture, and make no effort to hide their preference for Laos and Laotians to Vietnamese or Siamese or Chinese.

French administration in the area is indirect and there seems to be a conscious ef-

fort to make it really so. The Laotians in turn seem to fear Vietnamese and Siamese and appreciate French protection, a general picture quite different from the present bitter relations in Vietnam. Little evidence was seen of a Free Laos movement and one is led to believe that this is largely a Siamese-Vietnamese sponsored movement without much active popular support in Laos itself.[5]

[5] For those interested, recent articles on the peoples and cultures of Laos have appeared in a number of journals published in Indochina; for example, the Bulletin des Amis du Laos, which appeared annually from 1937 to 1940; the Bulletin de l'Institut Indochinois pour l'Etude de l'Homme (e.g., Nguyen-Xuan-Nguyen, *Contribution à l'étude des tatouages au Laos*, **4**: 99–111, 1942); and the Bulletin de l'Ecole Française d'Extrême Orient (e.g., Paul Lévy, *Les traces de l'introduction du Bouddhism à Luang Prabang*, **40**: 411–424, 1940). A good article on Kha religion is Karl Izikowitz's *Fastening the soul—some religious traits among the Lamet (French Indo-China)*, Göteborgs Högskoles Arrskrift **47**: (14): 3–32, 1941.

## BOTANY.—*Seven new species of Lobelioideae (Campanulaceae).*[1] ROGERS McVAUGH, University of Michigan. (Communicated by E. P. KILLIP.)

In the course of recent work on the American genera of Lobelioideae (Campanulaceae), several species apparently new to science have come to my attention. Descriptions based on all available materials of these species are given below. I am indebted to Dr. José Cuatrecasas and to the authorities of the Chicago Natural History Museum, as well as to E. P. Killip of the U. S. National Museum, for the opportunity to study the large Colombian collection made by Dr. Cuatrecasas. Dr. Julian A. Steyermark has put at my disposal his collections from Ecuador and from Venezuela, including two species which I have already described elsewhere (Brittonia **6**: 471, 474. 1949). P. H. Allen's collections are particularly interesting because they represent a relatively large addition to a small subsection of *Centropogon* (*Colombiani*), which has recently been intensively studied. For Joseph A. Ewan's South American collections (some of which have already been described in Brittonia **6**: 457, 467. 1949) I am indebted to the collector himself and to the U. S. National Arboretum, in whose herbarium the first set of the collections is deposited.

**1. Lobelia gladiaria McVaugh, sp. nov.**

Sect. *Hemipogon*; herba perennis glabra, foliis linearibus; corollae tubus fenestratus, 5.5–6.5 mm longus, non obliquus; filamenta 4.5–6 mm longa; antherarum 3 superiores apice papillosae; calycis lobi 2–3.5 mm longi appressi, denticulati; semina minute lineata.

Slender herbaceous perennial from a somewhat elongated and woody persistent rootstock, the weakly erect stems up to 60 cm long, 2 mm in diameter at base; plants glabrous except the pedicels, leafy below the middle, the 10–15 leaves linear, straight and stiff (hence *gladiaria*, of or pertaining to swords), 1.2–3 mm wide, 5–10 cm long, 30–50 times as long as wide, attenuate to apex and to the sessile base, slightly paler beneath, the margins somewhat involute, minutely denticulate with 1–2 teeth per cm; raceme up to about 20 cm long, secund, loosely few- to 20-flowered, pedunculate, the stem naked for 5–8 cm below it; pedicels slender, stiffly erect, 46 mm long in fruit, minutely hispidulous, bibracteolate near bases, the bracteoles linear or filiform, dark, appressed, 0.6–0.8 mm long; bracts subulate, denticulate, appressed, the lowest up to 6 mm long; flower about 15 mm long, including hypanthium; corolla "blue-violet" (Moore & Wood), apparently with no white "eye" but the tube pale ventrally, glabrous without (the lower lip strongly roughened at base), hairy within near base; corolla-tube fenestrate laterally, 5.5–6.5 mm long, nearly cylindric, about 1.5 mm thick; lobes of the lower lip elliptic, about 1.5–2 mm wide, 5 mm long, somewhat reflexed, the two upper lobes lanceolate, erect, about 0.8 mm wide at base, 4 mm long, attenuate; filament-tube 4.5–6.5 mm long, the filaments united less than 1 mm distally, otherwise distinct, ciliate near bases; anther-tube bluish gray, 1.9–2.5 mm long, the long anthers with minute white stiff hairs near tips and extremely short white papillose tufts at the very tips; short anthers with dense white apical tufts 0.4 mm long; hypanthium in anthesis turbinate, tapering at base, about

[1] Received February 24, 1949;

1.5–2 mm wide and high when pressed, in fruit similar, 2.5 mm across, the capsule 5 mm long, ellipsoid, about two-fifths inferior; calyx-lobes narrowly triangular, sharply pointed, denticulate, appressed in anthesis and in fruit, about 0.7–1 mm wide at base, 2–3.5 mm long; seeds ellipsoid, brown, smooth but with very fine longitudinal lines, 0.7 mm long.

MEXICO: Hidalgo: Dry ravine and ridges in pine-oak woods near Rancho San Alejo between Tulancingo and Acaxochitlan, alt. 7,000 feet, September 6, 1948, *H. E. Moore, Jr., & C. E. Wood, Jr., 4875* (TYPE, in herb. University of Michigan); about 2 km above Apulco on road to Agua Blanca, *Moore & Wood 4892* (herb. Bailey Hortorium).

This plant is evidently a member of the sect. *Hemipogon* as defined in the North American Flora **32A:** 45–65. 1943, but does not seem to have conspicuously close affinities with any single species. In general appearance it suggests *L. dielsiana*, of Guerrero, but in that species the corolla-tube is not fenestrate, the ovary is almost entirely superior and the calyx-lobes are much longer. The corolla of *L. gladiaria* suggests that of a small-flowered plant of *L. hartwegi*, but in other ways the plants are quite different.

2. **Siphocampylus uncipes** McVaugh, sp. nov.

Suffrutex caulibus tenuissimis, foliorum pagina superiore et calycis lobis exceptis glaber, foliis lanceolatis, attenuatis, subcordatis, margine fimbriatis, pedicellis medio bibracteolatis, floribus 3 cm longis; corollae tubus 15 mm longus; filamenta 23 mm longa.

Suffruticose terrestrial plant up to at least 60 cm. high, the glabrous stems very slender (2–2.5 mm in diameter at base including the corky bark) but "erectish" (Steyermark), with long internodes (up to 5 cm) and narrow leaves; leaves glabrous beneath, very minutely roughened above with stiff sharp colorless hairs about 0.1 mm long, the plants otherwise glabrous except the tips of the calyx-lobes; blades 0.8–1.5 cm wide, 2–5 cm long, 4–7 times as long as wide, lanceolate, subcordate at base or the younger ones rounded, all long-attenuate to a slender acumen 1 mm wide and 8–12 mm long; petioles flexuous, 0.7–1.7 cm long, very slender (less than 0.5 mm thick); margins fimbriate-dentate with 6–8 teeth per cm, the teeth slenderly triangular with dark callose tips, up to 3 mm high, the longest ones near base of blade and often spreading nearly at right angles or even, on the basal lobes of subcordate blades, directed backward; upper teeth more slender, shorter, appressed; flowers 10–12, in the axils of the somewhat reduced upper leaves (or a few of the axils bearing 1–3-flowered lateral branches), the floriferous part of the stem-axis somewhat zigzag; pedicels divaricate in anthesis and in fruit, 25–55 mm long and 0.5 mm in diameter, at maturity abruptly decurved distally (whence *uncipes*), bibracteolate near the middle, the bracteoles filiform, about 1.5 mm long; flower about 3 cm long; corolla "blood red, lobes orange-yellow" (Steyermark); tube 15 mm long, contracted just above base to a width of 1.5–2 mm (when pressed), thence gradually enlarged to a width of 4.5–6.5 mm just below the bases of the lobes, the dorsal side convex; lobes linear-attenuate, apparently curled outward in anthesis, the dorsal 2 mm wide at base, 8–10 mm long; lateral and ventral lobes about 1.5 mm wide, 8 mm long; filament-tube glabrous, 23 mm long, exserted, the filaments distinct near base and attached to the narrow basal portion of the corolla; anther-tube "blackish" (Steyermark), drying pale gray and the connectives yellowish white, 4.5–5 mm long, 1.5 mm thick, the long anthers with a few stiff white hairs near tips, the white apical tufts of the short anthers about 1 mm long; hypanthium in anthesis turbinate, about 3 mm long and wide when pressed, acute at base, the calyx-lobes erect, subulate, denticulate, 2–4.5 mm long and 0.7 mm wide at base, strigose near tips with hairs like those of the leaves; capsule campanulate, about 4 mm in diameter, 8–9 mm long, three-fourths inferior; seeds oblong or oblong-ovoid, 0.6–0.8 mm long, minutely pitted-reticulate with isodiametric or slightly elongated flat-bottomed pits.

ECUADOR: El Oro: between Curtincapa and Guagra Uma, 8 miles northeast of Curtincapa on southwest slopes leading to Chapel, alt. 1,500–2,895 m, dry rocky ground, August 16, 1943, *J. A. Steyermark 53922* (TYPE, in herb. University of Michigan; duplicate in herb. Chicago Natural History Museum).

This plant evidently is related to the group of Peruvian species exemplified by *Siphocampylus comosus*, perhaps *S. nobilis*, and perhaps also the Brazilian *S. igneus*. These species have relatively small red and yellow flowers, often in the axils of normal leaves like those of *Siphocampylus uncipes*.

3. **Centropogon uncialis** McVaugh, sp. nov.

Sect. *Eucentropogon*; herba hirsutula pilis septatis 0.5–0.7 mm longis, floribus 27 mm longis, in axillis foliorum normalium solitariis; calycis lobi triangulares, 5.5–7 mm longi; stamina glabra; filamenta 19–21 mm longa; antherarum 2 inferiores apice cornutae.

Succulent hairy terrestrial herb 50 cm high with coarse thin leaves; whole plant more or less thickly hirsutulous with colorless or sordid sharp 3–5-celled flaccid hairs 0.5–0.7 mm long which collapse on drying; leaves green both sides, strigose-hirsutulous above (often thinly so), rather densely hirsutulous beneath, especially on the veins; blades 3–8 cm wide, 15–18 cm long, 2 (or 4–5) times as long as wide in the material seen, narrowly or broadly elliptic, acute at tip, rounded or acute at base and then attenuate and long-decurrent on the petiole, the actual petiole often very short, 5–15 mm long, 1.5–2 mm in diameter, hirsutulous; margins irregularly serrate-dentate or denticulate, the teeth callosé-tipped, 8–10 per cm, 0.5–1 (−1.5) mm high; flowers 15 or more, in the axils of the little-reduced upper leaves; pedicels hirsutulous, 35–40 mm long and about 0.8 mm in diameter, ascending in flower, weakly spreading in fruit; bracteoles filiform, hairy, 1.5–2 mm long, at the middle of the pedicel or a little below this; flower about 27 mm long (*uncialis*), including hypanthium; corolla "red" (Haught), sparsely hairy without (the hairs as on the foliage), glabrous within; tube 17–18 mm long, slightly bent at the summit of the narrow basal portion, contracted immediately above base to a cylindrical tubular portion about 1.5 mm wide (when pressed) and 3 mm long, thence gradually enlarged to the mouth, where 6 mm wide when pressed; lobes triangular-falcate, the dorsal 2.3–2.7 mm wide at base, 5 mm long, the lateral and ventral similar, smaller, the ventral separate, 4–4.5 mm long; filament-tube 19–21 mm long, glabrous, slightly exserted, the filaments free at very base (3 mm) and fused to the corolla only below the narrow part of the tube; anther-tube 4–4.5 mm long, 1.5 mm in diameter, glabrous, drying pale reddish brown (not slate-gray), the two short anthers with apical triangular appendage 1.5 mm long; hypanthium in anthesis rounded, about as long as wide, hairy, 5–6 mm wide when pressed, the lobes triangular, appressed, narrowly acute, entire or minutely callose, hirsutulous, 2–2.5 mm wide at base (sinuses narrow, acute), 5.5–7 mm long; fruit dry, apparently membranaceous, depressed-globose, about 10 mm in diameter; seeds light brown, oblong-ovoid, flattened, about 0.6–0.8 mm long, strikingly reticulate with about 15 minute flat-bottomed pits across the broad diameter.

COLOMBIA: Cundinamarca: Between Pacho and Río Negro, "carretera y alrededores," alt. 1,000–1,200 m, February 22–26, 1942, *H. García Barriga 10744* (TYPE, in herb. University of Michigan); Pacho-Paime highway, alt. 2,200 m, August 13, 1947, *Oscar Haught 6072* (U. S. Nat. Herb.).

The two collections cited above agree in all particulars except that in the type the leaves are narrowly elliptic, 3–3.5 cm wide, and 4–5 times as long as wide; in Haught's collection the blades are 6.5–8 cm wide and about twice as long. Apparently no other species among the cornute Centropogons has the very small flowers (in the axils of normal foliage leaves) and the conspicuous hirsute pubescence of *C. uncialis*.

4. **Centropogon vittariaefolius** McVaugh, sp. nov.

*Brevilimbatorum*; frutex 2–3 metralis, foliis linearibus 2–3 mm latis, 50–80 mm longis, pilis stellatis, staminibus 60–65 mm longis, corollae tubo recto, 42 mm longo.

Much-branched shrub up to 2–3 m high with very many narrowly linear leaves; branches thickly tomentose with rusty-brown branched hairs, these blackening in age; leaves close together (often 50 leaves on the terminal 8 cm of a branchlet), linear, 2–3 mm wide, 50–80 mm long, slightly narrowed and obscurely mucronate at tip, attenuate to a tomentose petiolar base 2–4 mm long; blades green, sparsely stellate above, the midrib impressed, the lateral veins, if any, imperceptible to the eye; lower surface with prominently raised midrib almost obscured by abundant rufous tomentum (this forming a conspicuous median line), and scattered hairs elsewhere; hairs on this surface and the midrib stipitate, appearing stellate, the arms mostly 3–10 on each hair, up to 0.5 mm long, arising together from a single enlarged node; margins of the blades very slightly involute, denticulate, the teeth slightly intramarginal, callose, dark, often 3–4 mm apart; flowers axillary, 1 or 2 to a branch, on weakly spreading tomentose pedicels 2–4 cm long and 1 mm in diameter (excluding the hairs); bracteoles basal, about 0.5 mm long; flower about 6.5 cm long; corolla "scarlet"

(Ewan), glabrous within, the outer surface rather thickly beset with hairs like those of the leaves or slightly smaller; tube 40–43 mm long, straight and relatively narrow, contracted above base for a distance of 5–8 mm, then gradually widened to near the base of the lobes, where 6 mm wide when pressed (the whole very narrowly funnelform); lobes falcate, the dorsal 3.5 mm wide at base and 12–15 mm long, the lateral and ventral united into a lower lip 8–9 mm long, their free portions narrowly triangular, 5 mm long or less; filament-tube about 55 mm long, exserted about 1.5 cm, pilose with white simple hairs up to 0.7 mm long which collapse in drying, the filaments distinct at base and there fused with the narrow part of the corolla-tube for about 5 mm; anther-tube about 7 mm long, bluish gray, sparingly hirsute distally with sordid straight simple hairs 2 mm long; apical tufts of the short anthers apparently sparse, white, about 1.5 mm long; hypanthium in anthesis depressed-hemispheric, 5–6 mm across, tomentose, the lobes triangular with narrow acute tips, stellate, denticulate, 1.5 mm long and wide, separated by broad sinuses; fruit a dry "berry," not seen mature, probably about 6–7 mm across and 4 mm high, the hypanthium-rim about 1 mm high; seeds not seen.

COLOMBIA: Antioquía: Páramo de Sonsón, above Sonsón, Cordillera Central, 2,930 m, scattered among paramillo brush, May 23, 1944, *J. A. Ewan 15707* (TYPE, in herb. University of Michigan; duplicate in herb. U. S. National Arboretum).

The specific name is given in reference to the appearance of the clustered leaves, each with its median rusty brown line, the whole suggesting the leaves of a small clump of *Vittaria*. No other known species has these narrowly linear leaves; the flowers also are unusually large for the group of species with short triangular-subulate calyx-lobes (e.g., *Centropogon ferrugineus*) to which *C. vittariaefolius* seems most closely related.

5. **Centropogon floricomus** McVaugh, sp. nov.

*Colombianorum, C. gutierrezii* affinis sed floribus parvioribus; corollae lobi dorsales 16–18 mm longi pilosi; filamenta 50–55 mm longa; calycis lobi 4–5 mm longi; pedicelli 2 bracteolis 1.5 mm longis praediti.

Weak terrestrial herb up to about 1 m high, the stems glabrous below, rather sparsely appressed-puberulent on the younger parts, the hairs white or colorless or sometimes purple-tinged, about 6-celled, attenuate, 0.2–0.4 mm long, crisped, extending to the pedicels and flowers, and to the petioles and the veins of the lower surfaces of the leaves; leaves (often pale purplish when young) green and glabrous above (or with a few hairs on the midvein at base), pale beneath, the surface glabrous and the veins puberulent; blades lance-ovate, petiolate, decreasing gradually in size to the tips of the branches, 4–10 cm long, 2.3–2.8 times as long as wide, rounded to subcordate at base, unequal-sided and slightly decurrent on the petiole, broadest near base or in the basal one-third, where 2–4 cm wide, thence attenuate to a narrow almost caudate tip 2 mm wide and up to 1 cm long (or in some leaves having the basal half or two-thirds ovate and the distal third gradually attenuate, the blade thus widest near the middle); petioles 1–2.5 cm long, up to 1 mm in diameter, puberulent; margins finely and shallowly serrate, the teeth somewhat irregularly spaced, 5–6 per cm, with dark callose points up to 0.5 mm long; flowers 10–12, in the axils of the upper leaves; pedicels 7–8 cm long and about 1 mm in diameter, sparsely puberulent, weakly spreading and flexuous in fruit (ascending in flower), abruptly decurved near tip in fruit and the capsule thus pendent; bracteoles about 3–5 mm above base, 0.5 mm wide and 1.5 mm long, pointed, puberulent; flower 6.5–7 cm long, including hypanthium; corolla "bright pink, tipped white" (Allen), the ventral side paler, and sometimes only the lateral and ventral lobes white; tube 40–46 mm long (measured to the lateral sinuses), glabrous within, puberulent without, straight or slightly bent at the summit of the narrow basal portion; basal portion cylindrical, 10–15 mm long, 2–4 mm wide when pressed, the tube beyond this expanding to the cylindrical or narrowly funnelform throat 6–9 mm wide when pressed; lobes linear, the dorsal straight, in flower usually appressed to and slightly surpassing the stamens, 1.5–1.8 mm wide (2–2.5 mm at base), 16–18 mm long, acute, often with a number of stiff hyaline hairs 0.5–0.7 mm long on the outer surface near tip; lateral and ventral lobes similar, shorter, 12–13 mm long, curled outward in anthesis, the ventral slightly separated from the rest and apparently set further back on the tube because of the deeper sinuses adjacent to it; filament-tube 50–55 mm long, longer than the corolla-tube but not appearing exserted because of the erect dorsal

lobes, glabrous, the filaments distinct in the basal third and fused with the narrow proximal portion of the corolla-tube; anther-tube 7.5–8 mm long, "slate-gray" (Allen), glabrous, the two short anthers with dense terminal tufts of white hairs 1.5–2 mm long; hypanthium in anthesis campanulate or turbinate, acute at base, about 6 mm wide and 8–9 mm long when pressed, puberulent, the lobes arising from a rim about 1 mm high, the free parts acutely triangular with narrow dark spreading callose tips, entire or with one glandular tooth on each edge near base, puberulent, 2.5–3 mm wide at base, 4–5 mm long; corolla and stamens withering-persistent but finally breaking irregularly from the fruit about at maturity; fruit not seen mature, but apparently a pendent leathery somewhat inflated "berry," probably obovoid or nearly globose, 1–1.5 cm long; seeds about 0.6 mm long, reticulate-pitted, with small rounded pits in a coarse reticulum, probably ovoid-lenticular.

PANAMA: Bocas del Toro: Robalo trail, northern slopes of Cerro Horqueta, 6,000–7,000 feet, August 5–7, 1947, *P. H. Allen 4911* (TYPE, in herb. University of Michigan; duplicate in herb. Missouri Botanical Garden).

In appearance this species is not unlike *Centropogon gutierrezii*, which is restricted as far as known to the upper slopes of the great volcanoes of Costa Rica (e.g., Poas, Barba, Irazú). *Centropogon floricomus* may be distinguished easily from *C. gutierrezii* by its shorter calyx-lobes (4–5 mm instead of 10–22 mm) and much shorter bracteoles on the pedicels (1.5 mm as against 5–10 mm). The corollas and stamens of the two species are closely similar, except that the dorsal lobes in *C. floricomus* are shorter and less heavily pilose.

The addition of this and the following species increases to 16 the number of known species in Subsection *Colombiani*, Section *Wimmeriopsis* (see Brittonia **6:** 465–476, 1949).

6. **Centropogon leucocarpus** McVaugh, sp. nov.

*Colombianorum*; herba tenuis minute hispidula, foliis lanceolatis 1–2 cm latis, 4–5-plo longioribus quam latioribus, pedicellis ebracteolatis 3–4 cm longis; corollae tubus 23–24 mm longus; lobi attenuati, subaequales, 2.2–2.3 cm longi, non falcati; filamenta 28–29 mm longa; calycis lobi triangulares, 1.7–2 mm longi; bacca globosa, alba, diametro 5–6 mm.

Slender terrestrial herb to 75 cm high, all parts of the plant minutely hispidulous with erect or incurved white or colorless hairs 0.1 mm long, these rather sparse on the lower parts of the stem and the upper surfaces of the leaves but otherwise generally distributed; leaves green (or the youngest ones, like the young shoots, purplish), lanceolate, short-petiolate, the upper ones smaller; blades 1–2 cm wide, 3–10 cm long, 4–5 times as long as wide, rounded or obtusely angled at base and slightly decurrent on the petiole, broadest in the proximal third and thence tapering to the long-attenuate tip; petioles 0.4–1.4 cm long; margins shallowly serrate-dentate with (4–) 6–8 incurved, dark-tipped teeth per cm; flowers few (often 1–4) to a branch, in the axils of the upper leaves; pedicels slender and flexuous, somewhat ascending in anthesis and widely spreading in fruit, 3–4 cm long and about 0.7 mm in diameter; bracteoles wanting; flower slightly less than 4 cm long, including hypanthium; corolla "red" (Allen), drying purple, glabrous within, puberulent without with hairs like those of the vegetative parts but purplish; tube 23–24 mm long, slightly curved, slender, constricted above the base and there 1.5–2 mm wide when pressed, then enlarged, the distal two-thirds cylindrical or narrowly funnelform, 3.5–4.5 mm wide when pressed; lobes linear-attenuate with very slender almost caudate tips, subequal, about 1.5 mm wide at base, the dorsal straight, about 2.2 cm long, the lateral and ventral similar, somewhat curved (probably outward in the fresh flower), the ventral cut into the tube more deeply than the others and often 2.3 cm long; filament-tube 28–29 mm long, slightly exserted, glabrous, the filaments distinct near base and fused with the narrow proximal portion of the corolla-tube; anther-tube 4.5–5 mm long, gray (the commissures pale reddish brown when dry), glabrous except for a few short bristles near the tips of the longer anthers; terminal tufts of the short anthers white, dense, 1–1.1 mm long; hypanthium in anthesis campanulate, acute at base, 2.5–3 mm wide and 3.5–4 mm long when pressed, the calyx-lobes triangular, entire, 1.3–1.5 mm wide at base, 1.7–2 mm long; corolla and stamens withering-persistent on the fruit, which is a globose or oblate dry berry, "white" (Allen), 5–6 mm long and broad, crowned by the persistent sepals; seeds about 0.5 mm long, ovoid-lenticular, minutely reticulate with shallow flat-bottomed pits.

PANAMA: Chiriquí: Bajo Mono–Robalo trail, alt. 5,000–7,000 feet, western slopes of Cerro Horqueta, July 27, 1947, *P. H. Allen 4836* (TYPE, in herb. University of Michigan; duplicate in herb. Missouri Botanical Garden).

*Centropogon costaricae* is apparently closely related to *C. leucocarpus*, as suggested by the very similar corolla and stamens, the usually ebracteolate pedicels, and the white fruit. The leaves of the two species, however, are very different (lanceolate, 4–5 times as long as wide in *C. leucocarpus*; ovate, at most twice as long as wide in *C. costaricae*), and *C. costaricae* is usually glabrous almost throughout, with calyx-lobes 4–7 mm long (as against 1.7–2 mm long in *C. leucocarpus*).

7. **Burmeistera prunifolia** McVaugh, sp. nov.

Frutex, pilis luteis septatis superne vestitus; folia 3–4 cm longa, 2–3-plo longiora quam latiora, petiolis 2–3 mm longis; corollae tubus 18–19 mm longus, fere cylindricus; filamenta 27–28 mm longa; antherarum 2 inferiores apice villoso-barbatae, reliquae nudae; hypanthium campanulatum, basi attenuatum; calycis lobi 6–7 mm longi, patenti vel reflexi; bacca globosa diametro 4 mm.

Scrambling shrub, abundantly branched near the tips, the branches pendulous, angled, pustulate-roughened by the bases of old hairs; branchlets, young foliage and young flowers rather sparsely appressed-hirsute with thick-walled attenuate jointed (5–6-celled) dull yellowish hairs 0.4–0.8 mm long, these most abundant on the young branchlets, then rather early deciduous except for the slightly enlarged base; leaves numerous, thin (the internodes 0.7–1.5 cm long), glabrous above from the first, distichous (Cuatrecasas), violaceous beneath (Cuatrecasas), the lower surface with persistent scattered hairs especially on the veins; blades rather small, 1.3–2 cm wide, 3–4 cm long, 2–3 times as long as wide, ovate-lanceolate to ovate, rounded at base (occasionally subcordate), broadest well below the middle, gradually narrowed to an acute or broadly acuminate tip; petioles 2–3 mm long, 0.7 mm thick, hairy; margins very shallowly crenate with 1–3 intramarginal callosities per cm; flowers about 7–10, in the axils of upper leaves; pedicels 25–35 mm long, 0.7 mm in diameter, ebracteolate, sparsely hairy near base, weakly ascending or spreading in flower, spreading in fruit; flower 3 cm long; corolla "verde clara o con manchas palido violaceas" (Cuatrecasas), glabrous or with an occasional hair near the summit of the tube; tube 18–19 mm long, straight, cylindric or slightly narrowed toward the mouth, 2.5–3 mm wide when pressed flat; dorsal lobes elliptic, somewhat curved, 2.5–3 mm wide, 12 mm long, acute; lateral and ventral lobes ovate, acute, 3.5–4 mm wide, 7–10 mm long, forming a falcately decurved lower lip; filament-tube 27–28 mm long, glabrous or with a few long hairs distally, the filaments distinct at base, and fused to the corolla-tube for the basal 3 mm; anther-tube about 3 mm long and 2.5 mm thick, the long anthers glabrous, the short ones 2 mm long, glabrous except for the rather copious apical tufts of soft tangled white hairs 1 mm long; hypanthium in anthesis nearly or quite glabrous, campanulate, narrowed at base, a little longer than wide when pressed, 3–4 mm long, the lobes linear-attenuate, sparingly callose-denticulate, 1 mm wide at base, 6–7 mm long, nearly or quite glabrous, stellately spreading from the flower and fruit or slightly reflexed; fruit probably a dry small berry, white (Cuatrecasas), globose, crowned with the spreading calyx-lobes, about 4 mm in diameter; seeds ellipsoid-oblong, 0.7–0.9 mm long, with minutely pitted-reticulate surface, the pits slightly elongated.

COLOMBIA: El Valle: Cordillera Occidental, vertiente occidental, Hoya del Río Dígua, lado derecho, La Elsa, bosques, 1,000–1,200 m alt., November 9, 1943, *J. Cuatrecasas 15329* (TYPE, in herb. University of Michigan).

This species seems very different from any other previously described. In Wimmer's most recent study of the genus *Burmeistera* (Das Pflanzenreich IV.**276b**: 122–161. 1943) it would be treated as a member of the Section *Barbatae*, in which there are about eight other hairy species.

ZOOLOGY.—*On some western millipeds of the order Spirobolida.*[1] RALPH V. CHAMBERLIN, University of Utah. (Communicated by C. F. W. MUESEBECK.)

The present paper aims to present some results of a review of western, chiefly Californian, millipeds of the order Spirobolida. The genera represented are regarded as falling into two families, the Spirobolidae sens. str. and the Atopetholidae, here more restricted than in earlier usage.

The study has been based primarily upon material in my own collection now housed at the University of Utah where types of the new forms are for the present retained. The diagnoses of new forms are based in the main upon features of the male gonopods and are made brief, more detailed accounts being reserved for later elaboration.[2]

## Family SPIROBOLIDAE

This family as now conceived by the author is superficially characterized by having the second tergite produced conspicuously below the level of the end of the collum on each side. The gonopods are typically short and compact, without segmentation though sometimes with a free inner piece, each articulated to a conspicuously developed and strongly muscled basal support.

The genera occurring north of Mexico are *Spirobolus*, *Hiltonius*, *Auxobolus*, n. gen., *Californibolus*, and *Tylobolus*. In Mexico, in addition to *Hiltonius* and *Spirobolus*, the genera *Messicobolus* and *Aztecolus* at present represent the family. Attention here is given chiefly to species that in recent years have generally been referred to *Tylobolus* but that here are distributed among several genera.

### Auxobolus, n. gen.

This genus is proposed for a group of species differing from those of *Tylobolus* and *Californibolus* in that the coxal plates of the anterior gonopods but little, or sometimes not at all, exceed the sternite instead of meeting broadly in front of and caudad of it as they do in the other two general mentioned. From *Californibolus* it also differs in having the telopodite of the anterior gonopods distally strongly bent or subuncate instead of remaining essentially straight, and from *Tylobolus* in the form of the posterior gonopods. Orthotype: *Auxobolus ergus*, n. sp.

### Auxobolus ergus, n. sp.

Figs. 5–7

General color of the body reddish to chocolate-brown, with dark, nearly black, annuli, which are wider dorsally than down the sides. Legs reddish brown or chestnut. Darker individuals appear almost mahogany colored.

Clypeal foveolae 4—4. Eyes widely separated, their ocelli typically in 6 or 7 series.

Collum narrowed down the sides, margined along the anterior border below the level of the eyes, otherwise smooth or in some females with a shallow transverse furrow in front of the caudal border, this furrow almost sulciform toward its ends. The second tergite extending well below the lower end of the collum.

On the ordinary tergites the segmental sulcus is fine but distinct throughout; it bends forward to and embraces the repugnatorial pore. Segments strongly longitudinally striate beneath, but a wide space below each pore smooth and free of striae.

Last tergite essentially smooth except for a shallow transverse furrow in front of the caudal end. Anal valves prominent, smooth.

The characteristic features of the gonopods of the male are shown in Figs. 1, 2, and 3.

Number of segments, 51–53.

Length of male, 80 to 90 mm; width, 7 to 8 mm. Width of female up to 10 mm.

*Type locality.*—California: Tollhouse. Males and females taken March 23, 1941, by S. and D. Mulaik.

*Other records.*—California: Madero County; Kern County, 7 miles north of Glenvilles; also Clements. All collected by the Mulaiks in March 1941.

### Auxobolus castaneus (Chamberlin)

*Tylobolus castaneus* Chamberlin, Proc. Biol. Soc. Washington **31**: 166. 1918.

*Type locality.*—California: Brookdale.

### Auxobolus claremontus (Chamberlin)

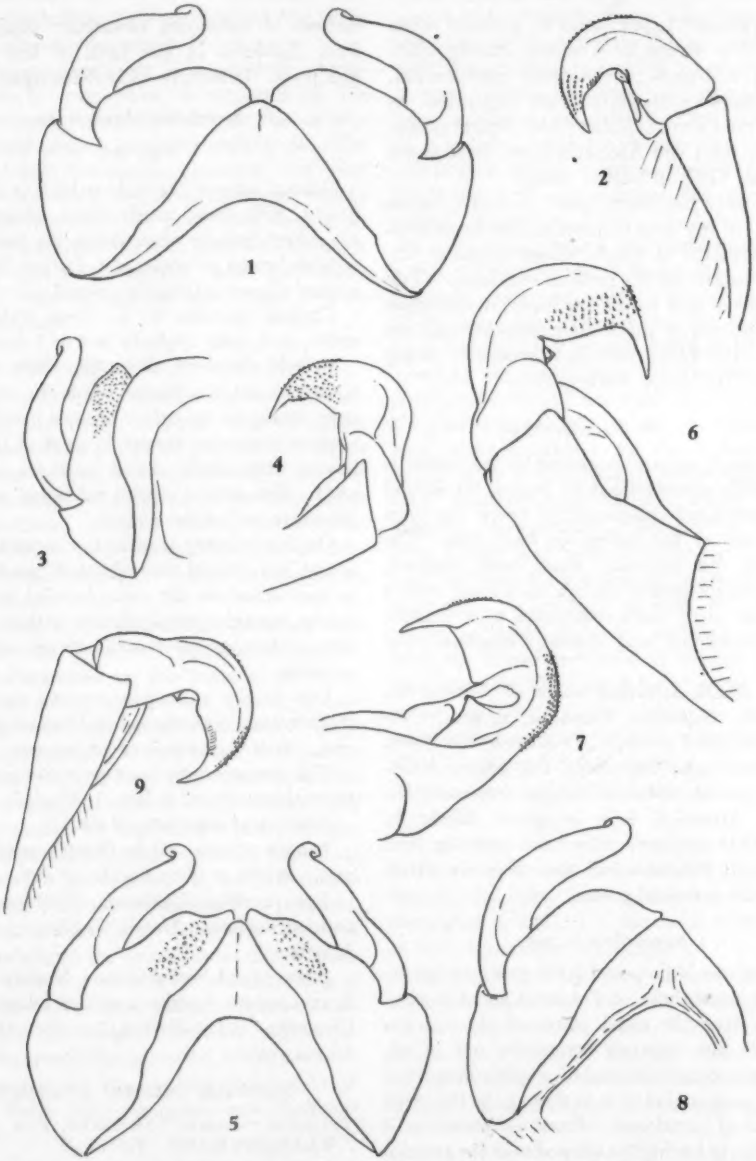
*Tylobolus claremontus* Chamberlin, Proc. Biol. Soc. Washington **31**: 165. 1918.

[1] Received January 18, 1949.

[2] In the references given in this paper under the various species, an asterisk (*) preceding a number designates a figure.

*Type locality.*—California: Claremont.

A common species in Los Angeles County. Figures of the anterior and posterior gonopods are here given (Figs. 1, 2).




FIGS. 1-9.—1, *Auxobolus claremontus* (Chamberlin), anterior gonopods; 2, the same, right posterior gonopod, cephalic aspect; 3, *Auxobolus discipulus*, n. sp., anterior gonopods; 4, the same, right posterior gonopod, cephalic aspect; 5, *Auxobolus ergus*, n. sp., anterior gonopods; 6, the same, right posterior gonopod, cephalic aspect; 7, the same, right posterior gonopod, caudal aspect; 8, *Auxobolus friantus*, n. sp., anterior gonopods; 9, the same, left posterior gonopod, cephalic aspect.

**Auxobolus discipulus**, n. sp.

Figs. 3, 4

General background of body brown to more or less chestnut, darkened with dusky or black annuli, which embrace a variable proportion of the tergites. Legs brown.

An obviously smaller form than *ergus* and *friantus*, with which it agrees in the more general structural features. Separable from those species in having the distal margin of the anterior sternite of the gonopods widely rounded instead of more or less acuminate. The telopodite of the posterior gonopods has the characteristic form represented in Fig. 4. For anterior gonopods see Fig. 3.

Number of segments, 50–52.

Diameter of male, 5.5–6 mm; of female up to 6.5 mm.

*Type locality.*—California: Ione. Male and female, March 27, 1941, taken by S. and D. Mulaik.

*Other record.*—California: Vicinity of Stanford University. Autumn of 1921, collected by J. C. Chamberlin.

**Auxobolus friantus**, n. sp.

Figs. 8, 9

The general color of the body seems to have been chestnut, now faded from long preservation and probable drying at some time.

The female is smaller than that of *ergus*, but the male is of approximately the same size. It is most readily distinguished by differences in the gonopods. The characteristic form of the posterior gonopods is shown in Fig. 9. The difference in the form of the anterior sternite and the anterior gonopods will be evident on comparing Fig. 8 with the corresponding figure for *ergus*, Fig. 5.

Number of segments, 53–55.

Width of male, up to 8 mm; of female, up to 8.25 mm.

*Type locality.*—California: Fresno County, Friant. Males and females taken in March 1913 by R. V. Chamberlin.

**Auxobolus monachus**, n. sp.

Figs. 10, 11

Caudal borders of tergites chestnut; elsewhere more or less blackish, the black in part, especially just above the level of the pores, forming a network of lines. Legs light chestnut.

Clypeal foveolae 4—4.

Most readily identifiable by the form of the telopodite of the posterior gonopods as shown in Fig. 11. The anterior sternite of the anterior gonopods is also of a form different from that of the other known species and is shown in Fig. 10.

Number of segments, 48.

Diameter of male holotype, 7 mm.

*Type locality.*—California: Monterey County, Hastings Reservation. Male holotype taken March 17, 1940, by Dr. J. M. Linsdale.

**Auxobolus simulatus**, n. sp.

Figs. 12, 13

A lighter-colored form than the others here listed, the metazonites being chestnut behind the segmental sulcus and light brown to yellow in front of it. The legs are reddish yellow.

Clypeal foveolae 5—5.

The sternite of the anterior gonopods distally acutely pointed, and the coxites of the anterior gonopods distally rounded and rather widely separated from each other as shown in Fig. 12.

Number of segments, 49.

Diameter of male holotype, 7 mm.

*Type locality.*—California: Riverside. An adult male and a younger specimen were taken in November 1925 by J. C. Chamberlin.

**Auxobolus stebbinsi** (Chamberlin)

*Tylobolus stebbinsi* Chamberlin, Proc. Biol. Soc. Washington **57**: 112; *4, 5. 1944.

*Type locality.*—California: Santa Monica Mountains, Meadow Canyon.

Genus **Californibolus** Verhoeff

Generotype: *Californibolus michelbacheri* Verhoeff.

This genus agrees with *Tylobolus* sens. str. in having the coxal plates of the anterior gonopods broadly in contact distad of the sternite, but differs in the form of the telopodite, which is more laminate and is distally straight and simply concave behind, not strongly curved or subuncate as it is in the other genus. Also the posterior gonopod does not present an obvious second distal lobe present in *Tylobolus*.

Six species, including three given as new, are referred to this genus and are listed below.

**Californibolus michelbacheri** Verhoeff

*Californibolus michelbacheri* Verhoeff, Bull. Southern California Acad. Sci. **43**: 50; ***12**: 1, 2, 3. 1944.

*Type locality.*—California: Vicinity of Fort Seward.

**Californibolus oregonus**, n. sp.

Figs. 14, 15

The tergites in front of each segmental suture are yellowish, in part slightly reddish brown above, being on most segments dusky along and in front of the suture down the sides, with an annulus of more or less chestnut color behind the suture.

This species, like *pontis* and *rectus*, is smaller than the generotype. In the telopodite of the posterior gonopods the terminal spine, while similarly long, is proportionately thicker at base and more acuminate than in *michelbacheri*, and the general form of the telopodite is different both in the tibiotarsal and the femuroidal divisions. The sternite of the anterior gonopods is distally more acute than in the generotype and presents a furrow or notch at its distal end. See further Figs. 14 and 15.

Number of segments, 51.

Width, 5.2 mm.

*Type locality.*—Oregon: Springfield. One male taken October 29, 1927, by D. T. Jones.

**Californibolus pontis**, n. sp.

Figs. 18, 19

Body light brown, with chestnut annuli encircling caudal borders of tergites. Legs light brown.

A considerably smaller form than the generotype and composed of fewer segments. The telopodite of the posterior gonopods differs obviously in the shorter, more rapidly acuminate, terminal spine, in presenting an obtuse angle or tooth on the caudal margin of tibiotarsus, and in general form as shown in Fig. 19. While the anterior gonopods are of the same general form, the sternite differs in presenting an acute tooth or process at the distal end in being more strongly narrowed distad. See further Figs. 18 and 19.

Number of segments, 48.

Length, about 45 mm; width, 4.7 mm.

*Type locality.*—California: Bridgeville. Male holotype taken in March 1928 by J. C. Chamberlin.

**Californibolus rectus**, n. sp.

Figs. 16, 17

Brown, with pronounced black annuli back of the segmental sutures and also a black stripe in front of each suture running from above level of pore and narrowing downward. Legs dusky brown, the proximal joints darkest.

The sternite of the anterior gonopods in outline acutely narrowing distad but very narrowly rounded at apex as shown in Fig. 16. Coxites of anterior gonopods of the same general form as in the other species but the telopodite differing at distal end as shown in the figure. The terminal spine of the posterior gonopods is slender, as in *michelbacheri*, but it is proportionately shorter, while there is a characteristic incision or notch on the mesal side where tibiotarsus meets the femuroidal division not present in other species. See further Fig. 17.

Diameter of holotype, 6 mm.

*Type locality.*—California: Solano County. One male from which the caudal end is lost.

**Californibolus uncigerus** (Wood)

*Spirobolus uncigerus* Wood, 1864, Proc. Acad. Nat. Sci. Philadelphia 1864: 15.—Trans. Amer. Phil. Soc. **13**: 209; *36. 1865.

*Tylobolus uncigerus* (Wood) Cook, Harriman Alaska Exped. **8** (1): 67. 1904.

*Type locality.*—California.

Wood's figure for this species shows the distinctive features of the genus very well. I have not recognized his species in material so far seen.

**Californibolus utahensis** (Chamberlin)

*Tylobolus utahensis* Chamberlin, Pan-Pacific Ent. **2** (2): 60. 1925.

*Type locality.*—Utah: Zion National Park.

Genus **Hiltonius** Chamberlin

Orthotype: *Hiltonius pulchrus* Chamberlin.

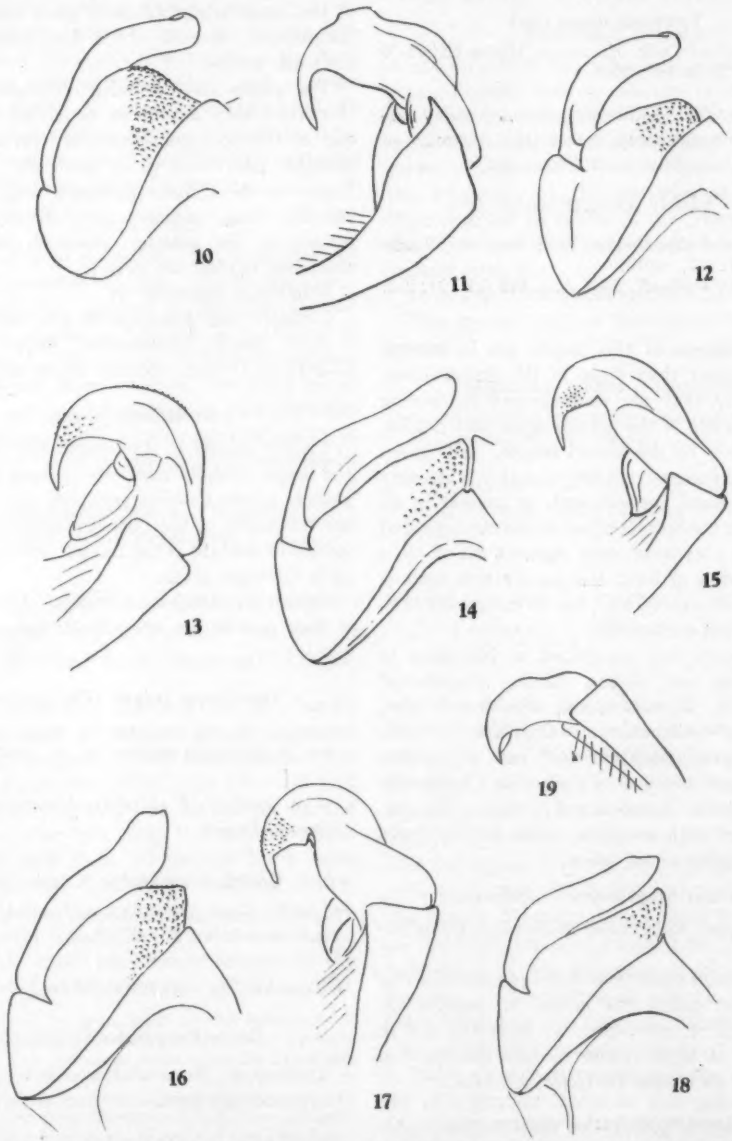
This well-marked genus is represented in California by *H. balboanus, H. congregans, H. conservatus, H. mimus, and H. pius*, in Arizona by *H. thebanus*, and in Mexico by *H. carpinus, H. crassus, H. erythrotypus, H. federalis, H. michoacanus. H. tancitarus*, and *H. veracruzanus*, all named by the author, and *H. hebes* (Bollman).

Genus **Tylobolus** Cook

Orthotype: *Tylobolus deses* Cook.

Differing from the other genera of the family in the form of the posterior gonopods. These have the general form and structure of those of *Auxobolus* but differ in the much greater length of the terminal spine and in the better-developed setae or prickles that extend to its tip, or very

nearly so, instead of their being present only at and proximad of the base of the spine, and also especially in presenting a conspicuous lamina or lobe ectad of the base of the spine. It agrees with *Californibolus* and differs from *Auxobolus* in having the coxites of the anterior gonopods




FIGS. 10–19.—10, *Auxobolus monachus*, n. sp., anterior gonopods; 11, the same, right posterior gonopod, cephalic aspect; 12, *Auxobolus simulatus*, n. sp., anterior gonopods; 13, the same, right posterior gonopod, cephalic aspect; 14, *Californibolus oregonus*, n. sp., anterior gonopods; 15, the same, right posterior gonopod, cephalic aspect; 16, *Californibolus rectus*, n. sp., anterior gonopods; 17, the same, right posterior gonopods, cephalic aspect; 18, *Californibolus pontis*, n. sp., anterior gonopods; 19, the same, right posterior gonopods, cephalic aspect.

broadly in contact distad and caudad of the sternite.

Only the type species is at present known with certainty to belong to *Tylobolus* as here restricted.

**Tylobolus deses** Cook

*Tylobolus deses* Cook, Harriman Alaska Exped. **8** (1): 65; *4: 3a–3h. 1904.

*Type locality.*—California: Exact locality not known, but probably either the vicinity of Stanford University or of Claremont.

Family ATOPETHOLIDAE

Atopetholidae Chamberlin, Proc. Biol. Soc. Washington **31:** 167. 1918.
Onychelidae Verhoeff, Zool. Anz. **122** (11–12): 273. 1938.

The millipeds of this family are in general mostly smaller than those of the Spirobolidae. Superficially they are characterized by having the lower ends of the collum acute and not exceeded below by the second tergite. The gonopods of the male are not articulated to a strongly developed basal support such as present in all members of the Spirobolidae but are characterized by having a separate basal segment set off by a definite suture or joint, this basal article tending to be placed transversely, i.e., to run mesad from the base of the telopodite

The genera now recognized as belonging to this family are *Anelus* Cook, *Atopetholus** Chamberlin, Eurelus Cook, *Gosichelus**, new, *Hesperolus** Chamberlin, *Onychelus** Cook, *Tidolus**, new, and *Watichelus**, new, of our own country, and the genera *Toltecolus* Chamberlin and *Tarascolus* Chamberlin of Mexico. The genera marked with asterisks occur in California and are further noted below.

Genus **Atopetholus** Chamberlin

Orthotype: *Atopetholus californicus* Chamberlin.

Five species have heretofore been described by the author under this genus: *A. angelus*, *A. californicus*, *A. carmelitus*, *A. fraternus*, and *A. paroicus*. A sixth species is here described as new. All six species are from California.

**Atopetholus barbaranus,** n. sp.

Tergites chestnut to black behind sulcus, in front of which brownish gray to darker brown. Legs from light chestnut to nearly black.

Clypeal foveolae 5—5.

Claws of first three pairs of legs longer than the ultimate joint. The coxae of these legs with swellings or pads beneath, while the coxae of the immediately following pairs are strongly compressed. Sternite of the third gonopod with the usual process.

The species may be readily distinguished from the others thus far known in having the distal end of the posterior gonopods with its border straight, not rolled in or recurved. The two fingers of the anterior gonopods are characteristically long, slender and divergent. The coxites of the anterior gonopods moderately extending beyond the sternite.

Number of segments, 48.

Length of male holotype, 40 mm; width, 5 mm.

*Type locality.*—California: Santa Barbara County at Orcutt. Several males and females.

**Gosichelus,** n. gen.

Closely related to *Atopetholus* but differing in the longer, distally narrower or more acuminate sternite of the anterior gonopods and in having the telopodite of the posterior gonopods simply incised or dentate at the tip, not strongly hooked as in the other genus.

Orthotype: *Gosichelus medolus* (Chamberlin).

Two species are at present known for this genus.

**Gosichelus jaegeri** (Chamberlin)

*Onychelus jaegeri* Chamberlin, Proc. Acad. Nat. Sci. Philadelphia **99:** 50; *54, 55. 1947.

*Type locality.*—California: Riverside County, Colorado Desert.

**Gosichelus medolus** (Chamberlin)

*Onychelus medolus* Chamberlin, Bull. Univ. Utah, biol. ser., **6** (4); 13; *2: 17, 18. 1941.

*Type locality.*—Arizona: Olberg.

Genus **Hesperolus** Chamberlin

Orthotype: *Hesperolus wheelleri* Chamberlin. A monotypic genus.

**Hesperolus wheeleri** Chamberlin

*Hesperolus wheeleri* Chamberlin, Proc. Biol. Soc. Washington **31:** 170. 1918.

*Type locality.*—California: Santa Ynez Canyon, Cold Spring Canyon.

Genus **Onychelus** Cook

Orthotype: *Onychelus obustus* Cook.

This genus, characterized by having the telopodite of the posterior gonopods in the form of a simple erect or falcate blade, embraces the following species: *O. michelbacheri* Verhoeff, *O. obustus* Cook, and *O. phanus* Chamberlin from the southwestern area in addition to *O. nigrescens* Chamberlin from Lower California.

**Tidolus,** n. gen.

Differing from *Atopetholus* in the smaller and simpler telopodite of the anterior gonopods, which does not present a caudally directed branch or process and which is concealed in front view by the coxite. Posterior gonopods comparatively large, each in the form of an elongate, curved or bent, lamina that gradually narrows distad and has its margins turned up so as to form a furrow or channel along mesocaudal side.

Orthotype: *Tidolus parvus* (Chamberlin).

This genus is, so far, monotypic.

**Tidolus parvus** (Chamberlin)

*Atopetholus parvus* Chamberlin, Proc. Biol. Soc. Washington **31**: 168. 1918.

*Type locality.*—California: Claremont.

**Watichelus,** n. gen.

Differing from *Onychelus* in the much shorter, proportionately broader, sternite of the anterior gonopods, the large telopodite of which lacks the distal prolongation characterizing the other genus. In place of the simple blade representing the telopodite of the posterior gonopods in *Onychelus*, the telopodite in the present genus is distally furcate, with the principal branch simply dentate at its tip.

Orthotype: *Watichelus smithi* (Chamberlin).

This genus is as yet represented by a single species.

**Watichelus smithi** (Chamberlin)

*Onychelus smithi* Chamberlin, Proc. Acad. Nat. Sci. Philadelphia **99**: 49; *52, 53. 1947.

*Type locality.*—California: Riverside County, Murray Canyon, about 3 miles north of Palm Canyon.

## ICHTHYOLOGY.—*Keys to the genera of echelid eels and the species of* Muraenichthys *of the Pacific, with two new species.*[1] LEONARD P. SCHULTZ and LOREN P. WOODS,[2] U. S. National Museum.

The worm eels referred to the family Echelidae form a complex group of species, occurring in most of the warm seas of the world. They are difficult to identify, and some species appear to be allied to the Ophichthyidae but lack the sharp-pointed tail. No less than 22 genera have been placed in the family at various times. Among these the following have been assigned to other families: *Verma* Jordan and Evermann, 1896, apparently related to the Ophichthyidae; *Bathymyrus* Alcock, 1890, referred to the Congridae by Myers and Storey, 1939, who refer *Sinomyrus* Lin, 1933, to the Dyssomidae; *Merinthichthys* Rivero, 1934, which may belong to the Moringuidae; *Heteromyrus* Pietschmann, 1935, redescribed in 1938 by him and probably belonging with the Muraenidae; *Chrinorhinus* Rivero, 1932, probably belonging in the family Moringuidae, judged from notes on the type, kindly furnished by William C. Schroeder, of the Museum of Comparative Zoology. This leaves 16 genera, and there have been few attempts to compare them. Parr (Bull. Bingham Oceanogr. Coll. **3** (4): 8. 1927) clearly demonstrated the advisability of referring *Ahlia* to the synonymy of *Myrophis*. After examining the position of dorsal fin anywhere from over rear of head to a little behind anus and the variability of the dentition, we have gone still further

[1] Published by permission of the Secretary of the Smithsonian Institution. Received January 31, 1949. The drawings were made by Dorothea B. Schultz.

[2] We wish to correct a printer's error in our last paper, "A New Name for *Synchiropus altivelis* Regan, with a Key to the Genera of the Fish Family Callionymidae," in this JOURNAL **38** (12): 420. 1948. Section *5b* in the key is out of place as printed. It should have been placed before section *8a*.

TABLE 1.—MEASUREMENTS MADE ON CERTAIN SPECIES OF MURAENICHTHYS RECORDED IN THOUSANDTHS OF THE TOTAL LENGTH

| Characters | *retropinnis* Fowler | | | | *philippinensis*, n. sp. | | *johnstonensis*, n. sp. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Holotype | Marshall Islands | | | Philippines | | Johnston Island | | Bikini Atoll |
| Total length in mm | 114 | 111 | 107 | 105 | 119 | 92 | 145 | 81 | 122 |
| Snout to anus | 368 | 378 | 420 | 382 | 520 | 533 | 390 | 365 | 369 |
| Snout to dorsal origin | 544 | 558 | 560 | 518 | 739 | 696 | 569 | 558 | 549 |
| Snout tip to tip of chin | 7 | 7 | 6 | 7 | 2 | 2 | 8 | 11 | 8 |
| Greatest depth | 22 | 19 | 19 | 19 | 27 | 27 | 30 | 42 | 33 |
| Head | 100 | 105 | 107 | 100 | 98 | 101 | 117 | 126 | 100 |
| Snout | 18 | 18 | 19 | 17 | 13 | 13 | 23 | 28 | 19 |
| Eye | 6 | 5 | 7 | 5 | 4 | 4 | 10 | 10 | 7 |
| Snout to rictus | 32 | 27 | 28 | 27 | 27 | 26 | 32 | 38 | 30 |
| Anal origin to dorsal origin between vertical lines | 158 | 153 | 127 | 128 | 183 | 163 | 169 | 170 | 140 |
| Interorbital space | 9 | 8 | 10 | 9 | 10 | 10 | 14 | 13 | 10 |

and referred four other genera to *Myrophis* (see key). Myers and Storey (1939, p. 159) did not fully agree with this viewpoint; instead they described a new genus, *Hesperomyrus*. It is our opinion that the recognition of echelid genera must be done on a world basis and not on a study of local fauna.

The numerous species centering around *Muraenichthys* Bleeker are all without pectoral fins, and these too have the position of the dorsal fin origin anywhere from over the rear of the head to 1½ head lengths behind the anus. Since there is much variability in the origin of the dorsal among the various species, in our opinion that character can not be used generically with this group of species. The teeth are variable, differing on jaws and vomer, from bands to a uniserial row, or absent on the vomer. We believe the dentition to be an excellent specific character. We have concluded that *Muraenichthys* should include all those echelid eels without pectoral fins, as defined in our key to genera, with a list of synonyms. Myers and Wade (1941) did not agree with this viewpoint; instead they recognized *Garmanichthys* Seale and described as new *Leptenchelys*, basing their generic separation largely on pointed snout, position of dorsal origin, uniserial vomerine teeth, and short tail, all of which characters are highly variable among the known species of this group. The median groove on underside of snout is a character present in *Leiuranus* of the family Ophichthyidae.

The genus *Muraenichthys* as recognized herein might be broken into subgenera after a comparison of all species in regard to the following important characters: (1) Position of posterior nasal opening, (2) Median groove on underside of snout between nostrils, as in *M. labialis* Seale and *M. vermiformis* (Myers and Wade), (3) pointed or blunt snout, (4) position of anus, and, one of the most important, (5) the dentition. Other characters are origin of dorsal fin, incompleteness of lateral line, position of bases of anterior nostrils in reference to tip of lower jaw, and distance between bases of anterior nostrils.

KEY TO THE GENERA OF ECHELIDAE

1*a*. Vomerine teeth arranged in 2 uniserial rows widely separated except where they divide anteriorly or may meet again posteriorly; teeth in lower jaw in 2 or 3 rows anteriorly, sometimes becoming uniserial posteriorly.

2*a*. Pectoral fin absent; lip at side of lower jaw folded downward; posterior nasal opening on inside of upper lip, below front of eye, without valvular flap; dorsal origin about ½ to ¾ head length behind gill opening; snout and tip of lower jaw broadly rounded; maxillary teeth uniserial.

*Chilorhinus* Lütken[3]

2*b*. Pectoral fin present; lips without folds; posterior nasal opening in upper lip under front of eye with valvular flap; dorsal fin origin slightly behind gill opening; snout and tip of lower jaw bluntly rounded.

*Kaupichthys* Schultz[4]

1*b*. Vomerine teeth, if present, arranged along midline of roof of mouth, represented as a single tooth or a uniserial row or a narrow to broad band.

[3] *Chilorhinus* Lütken, Vid. Med. Nat. Fören. Kjøbenhavn, 1852, **1**: 16. (Type, *C. suensonii* Lütken.)

[4] *Kaupichthys* Schultz, U. S. Nat. Mus. Bull. **180**: 50. 1943. (Type, *K. diodontus* Schultz.)

3*a*. Pectoral fin present, sometimes represented by a tiny dermal flap near upper edge of gill opening.

4*a*. Vomerine teeth in a broad band, notably wider near middle of length than at ends; maxillary and dentary with teeth in a band; dorsal fin origin over tips of pectorals or nearly so; a transverse white line on nape....*Echelus* Rafinesque[5]

4*b*. Vomerine teeth, if present, in a narrow straight band or uniserial, never broadened near middle of length; teeth in jaws usually in 2 or 3 rows anteriorly, sometimes becoming uniserial posteriorly or uniserial throughout their length; dorsal fin origin from over gill opening to slightly behind anus.

*Myrophis* Lütken[6]

3*b*. Pectoral fin absent; dorsal origin from over middle of head to any location as far posteriorly as 1½ head lengths behind a vertical line through anus; teeth on vomer, if present, varying from a uniserial row to a band and those on jaws varying from a uniserial row to a band..*Muraenichthys* Bleeker

### Genus **Muraenichthys** Bleeker

*Muraenichthys* Bleeker, Nat. Tijdschr. Ned. Ind. **4**: 505. 1853; Verh. Batav. Genoot. **25**, Muraen.: 52, 64, 71. (Type, *Muraena gymnopterus* Bleeker, designated in Atlas Ichthy.: 20. 1864.)

*Scolecenchelys* Ogilby, Proc. Linn. Soc. New South Wales, 1897 (2): 246. (Type, *Muraenichthys australis* Macleay.)

*Myropterus* Ogilby, Proc. Linn. Soc. New South Wales, 1897 (2): 247. (Type, *M. laticaudata* Ogilby (not of Bleeker).)

*Garmanichthys* Seale, Bull. Mus. Comp. Zool. **61** (4): 80. 1917. (Type, *G. dentatus* Seale.)

*Arenichthys* Beebe and Tee-Van, Zoologica **23** (3): 301. 1938. (Type, *A. apterus* Beebe and Tee-Van.)

*Leptenchelys* Myers and Wade, Allan Hancock Pacific Exped. **9** (4): 72. 1941. (Type, *L. vermiformis* Myers and Wade.)

During our studies of the fishes of the atom bomb tests from the Marshall Islands and vicinity, we have observed two new species of *Muraenichthys*, one from the Philippines and the other from Johnston Island south of the Hawaiian group. These two new echelid eels are distinguished in the following key and then more fully described.

#### TENTATIVE KEY TO THE SPECIES OF MURAENICHTHYS OF INDO-PACIFIC

1*a*. Dorsal fin origin more than one head length behind anus; snout not strongly acute.

2*a*. No teeth on premaxillary or vomer; snout to anus 2.4 to 2.7, snout to dorsal origin 1.8 to 1.9, all in total length.

3*a*. Greatest depth 45 to 54 and head 10 to 10.5, all in total length.

*Muraenichthys retropinnis* Fowler

3*b*. Greatest depth 24 or 25, head 7.9 to 8.5 all in total length.

*Muraenichthys johnstonensis*, n. sp.

2*b*. Teeth on vomer biserial, those on maxillary and on dentary uniserial, a few premaxillary teeth; posterior nasal opening on outside of upper lip below lower front of eye; greatest depth 37, head 9.9 to 10.2, snout to dorsal origin 1.4, all in total length.

*Muraenichthys philippinensis*, n. sp.

1*b*. Dorsal fin origin less than a head length behind anus or in advance of it; teeth present on maxillary and on vomer.

4*a*. Dorsal fin origin closer to gill opening than to anus (see also 4*b*, 4*c*, 4*d*).

5*a*. Dorsal fin origin over gill opening or in front of it.

6*a*. Dorsal origin over gill opening; teeth in a narrow band on maxillary and dentary, inner row largest; vomerine teeth biserial.

*Muraenichthys bicollaris* Myers and Wade

6*b*. Dorsal origin notably in advance of gill openings; teeth uniserial on maxillary, dentary and vomer.

*Muraenichthys vermiformis* Myers and Wade

5*b*. Dorsal fin origin somewhat behind gill opening.

7*a*. Anterior nostrils tubular, elongate, their bases in front of tip of chin, and separated by a groove, sides of which are formed by a dermal fold, the groove continuing on underside of snout nearly to its tip; dorsal fin origin nearly a head length behind gill opening; teeth

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[5] *Echelus* Rafinesque, Caratteri Nuov. An. Sicil.: 63. 1810. (Type, *E. punctatus* Rafinesque, designated by Bleeker, Atlas Ichthy. **4**: 20. 1864.)

*Myrus* Kaup, Archiv Naturg. 1856 (1): 53. (Type, *Muraena myrus* Linnaeus = *E. punctatus* Rafinesque.)

[6] *Myrophis* Lütken, Vid. Medd. Nat. Fören. Kjøbenhavn, 1852, **1**: 1. (Type, *Myrophis longicollis* Kaup = *Myrophis punctatus* Kaup.)

*Paramyrus* Günther, Catologue of fishes in the British Museum **8**: 51. 1870. (Type, *Conger cylindroideus* Ranzani, designated by Jordan and Davis, Rep. U. S. Fish Comm. **16**: 641. 1892.)

*Holopterua* Cope, Trans. Amer. Philos. Soc. **16**: 482. 1871. (Type, *H. plumbea* Cope.)

*Ahlia* Jordan and Davis, Rep. U. S. Fish Comm. **16**: 641. 1892. (Type, *Myrophis egmontis* Jordan.)

*Parabathymyrus* Kamohara, On the offshore bottom-fishes of Prov. Tosa, Shikoku, Japan: 14, fig. 4. 1938. (Type, *P. macrophthalmus* Kamohara.)

*Hesperomyrus* Myers and Storey, Stanford Ichthy. Bull. **1** (4): 156. 1939. (Type, *H. fryi* Myers and Storey.)

in a single row on maxillary and on dentary; rear margin of eye over rictus; snout acute.

*Muraenichthys labialis* Seale

7*b*. Anterior nostrils tubular, not notably elongate, their bases opposite tip of chin; no groove or dermal folds between anterior nostrils; teeth on maxillary and on dentary in a narrow band, inner row largest; vomerine teeth in 2 rows or an irregular row.

8*a*. Dorsal fin origin less than a snout length behind gill openings.

*Muraenichthys apterus* (Beebe and Tee-Van)

8*b*. Dorsal fin origin about 4 or 5 snout lengths behind gill openings.

*Muraenichthys macropterus* Bleeker[7]

4*b*. Dorsal fin origin equidistant or nearly so between gill opening and anus.

*Muraenichthys thompsoni* Jordan and Richardson[8]

4*c*. Dorsal fin origin closer to anus than gill opening, but notably in front of anus; tip of snout and of lower jaw bluntly rounded.

9*a*. Teeth on vomer in a broad flattish patch forward, becoming a row posteriorly; those on maxillary and on dentary in a band.

10*a*. Dorsal fin origin ⅓ to ½ head length in front of anus.

*Muraenichthys hattae* Jordan and Snyder

10*b*. Dorsal fin origin ⅔ to ¾ head length before anus.

*Muraenichthys gymnopterus* (Bleeker)[9]

9*b*. Teeth on vomer in one or two rows; teeth on maxillary and on dentary uniserial or biserial.

11*a*. Dorsal fin origin ⅓ to ½ head length in front of anus.

*Muraenichthys godeffroyi* Regan[10]

11*b*. Dorsal origin from ½ to ¾ head length in front of anus.

12*a*. Vomerine teeth biserial.

*Muraenichthys sibogae* Weber and de Beaufort

12*b*. Vomerine teeth uniserial.

*Muraenichthys cookei* Fowler

4*d*. Dorsal fin origin over anus or nearly so to less than a head length behind anus.

13*a*. Rear margin of eye notably in advance of rictus of mouth.

14*a*. Teeth on maxillary and on dentary uniserial, those on vomer in 1 or 2 rows; snout acute.

15*a*. Dorsal origin ¾ head length behind anus; greatest depth 40 to 45 in total length.

*Muraenichthys tasmaniensis* McCulloch

15*b*. Dorsal fin origin about ½ head length behind anus.

*Muraenichthys iredalei* Whitley

15*c*. Dorsal fin origin over anus or anal origin or nearly so.

16*a*. Greatest depth 27 to 30 in total length.

*Muraenichthys macrostomus* Bleeker

16*b*. Greatest depth 40 to 50 in total length.

*Muraenichthys australis* Macleay[11]

14*b*. Teeth on maxillary and on dentary in at least two rows or in a narrow to wide band, sometimes becoming one row posteriorly; dorsal origin from nearly over anus to ½ head length behind anus.

17*a*. Snout bluntly rounded; bases of anterior nostrils a little behind tip of chin; greatest depth 20 to 30 in total length, teeth in broad bands on maxillary, dentary and on vomer.

*Muraenichthys schultzei* Bleeker

17*b*. Snout acute; greatest depth 30 to 50 in total length.

18*a*. Rear margin of eye only slightly in advance of rictus of mouth; tip of snout to rictus about 4 in head; bases of anterior nostrils opposite tip of chin; teeth on inner row of maxillary and dentary largest; eye diameter about equal to distance from tip of chin to tip of snout; anterior margin of eye closer to rictus than tip of chin; snout moderately pointed; eye 12 to 15 in head.

*Muraenichthys gymnotus* Bleeker

18*b*. Rear margin of eye notably in advance of rictus; tip of snout to rictus about 3 in head; eye a little in front of middle of cleft of mouth; snout much pointed; eye 26 to 27 times in head.

*Muraenichthys acutirostris* Weber and De Beaufort

13*b*. Rear margin of eye over rictus of mouth; dorsal fin origin from slightly in front of anus to ½ head length behind anus; snout bluntly rounded; greatest depth about 24 to 34 in total length.

*Muraenichthys laticaudata* (Ogilby)

**Muraenichthys johnstonensis**, n. sp.

Fig. 1

*Holotype.*—U.S.N.M. no. 141268, Johnston Island, northern reef, August 28–29, 1947, L. P. Schultz, total length 145 mm.

*Paratypes.*—U.S.N.M. no. 141269, taken with holotype and bearing same data, total length 81

[7] Synonym: *Muraenichthys breviceps* Günther, Ann. Mag. Nat. Hist., ser. 4, 17: 401. 1876 (Tasmania).

[8] Probable synonym: *Muraenichthys malabonensis* Herre, 1923.

[9] Synonym: *M. microstonus* Bleeker, Atlas Ichthy.: 32, pl. 150, fig. 2. 1864 (Celebes Sea).

[10] Synonym: *Muraenichthys elerae* Fowler, 1934, U.S.N.M. no. 92348, holotype.

[11] Probable synonym: *M. oliveri* Waite, 1910.

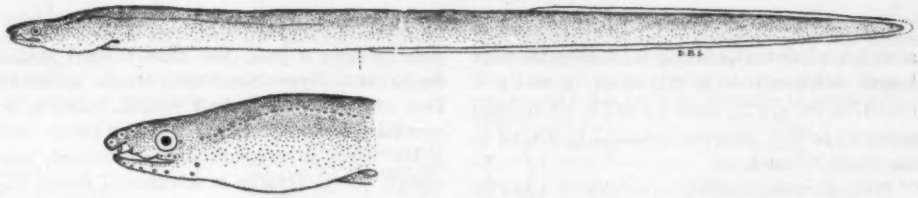

FIG. 1.—*Muraenichthys johnstonensis*, n. sp.: Holotype (U.S.N.M. no. 141268), from Johnston Island; total length 145 mm.

mm; U.S.N.M. no. 141692, Bikini Atoll, Arji Island, lagoon, depth 20 to 40 feet, August 7, 1946, Brock and Herald, 1 specimen, 122 mm.

*Description.*—Precision measurements were made on the types and these data are recorded in thousandths of the total length in table 1.

Greatest depth 24 or 25, head 7.9 to 8.5, snout to anus 2.6 to 2.7, snout to dorsal fin origin 1.8, all in the total length. Greatest depth 3.0, snout tip to tip of chin 11 to 15, eye 11 to 13, snout 4.4 to 5.0, interorbital space 8.5 to 9.3, snout to rictus 3.3 to 3.7, all in the length of the head.

Posterior nasal opening in upper lip below front of eye with valvular flap, anterior nostrils tubular, their bases opposite tip of chin; no groove on under side of snout between nostrils; eye small, without free margin; dorsal fin origin about 1.3 to 1.5 head lengths behind anus; anal origin close behind anus; both dorsal and anal fins confluent with the small minutely rayed caudal fin; anus a little behind the front third of the total length; gill opening a small pore on lower sides; no pectoral fin; lateral line near middle of sides incomplete, ending a little in front of anus; lips without cirri; tongue adnate to floor of mouth; teeth almost villiform in a band on maxillary, broadening posteriorly opposite eye, those on dentary similar and in a band; no teeth on vomer; teeth either lacking on premaxillary or embedded; rear margin of eye over rictus or slightly behind it, front margin of eye closer to rictus than tip of chin; snout bluntly rounded.

*Color in alcohol.*—Sides and back finely brown pigmented; ventral side white; area below and behind eye white.

*Remarks.*—This species is closely related to *M. retropinnis* Fowler in regard to its peculiar dentition, especially the long band of teeth on the maxillary broadened opposite orbit and complete lack of teeth on the vomer. It differs from *retropinnis* in having a robust body of a compressed shape instead of more tubular as in *retropinnis*. From other species of *Muraenichthys* in the Pacific it may be separated by means of the key.

**Muraenichthys philippinensis**, n, sp.

Fig. 2

*Holotype.*—U.S.N.M. no. 134951, Philippine Islands, Badian Island, lat. 11°31′40″N., long. 124°42′40″E., *Albatross*, April 14, 1908, 32 fathoms, total length 92 mm.

*Paratype.*—U.S.N.M. no. 134952, Philippine Islands, Luzón, Balayan Bay, *Albatross*, February 20, 1908, surface light, total length 119 mm., condition poor.

*Description.*—Precision measurements were made on the types and these data, recorded in table 1, are expressed in thousandths of the total length.

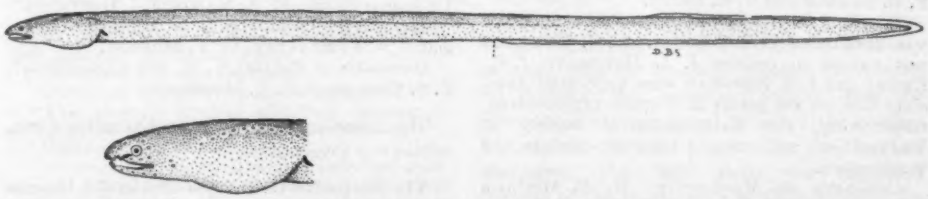

FIG. 2.—*Muraenichthys philippinensis*, n. sp.: Holotype (U.S.N.M. no. 134951), from Badian Island, Philippines; total length 92 mm.

Greatest depth 37, head 9.9 to 10.2; snout to anus 1.9, snout to dorsal origin 1.4, all in the total length. Greatest depth 3.7, snout tip to tip of chin 47 to 58, eye 23, snout 7.7 to 7.8, interorbital space 9.8 to 10.3, snout to rictus 3.7 to 3.9, all in the length of the head.

Posterior nasal opening on outside of upper lip at lower front of eye, with a short valvular flap, anterior nostrils tubular, their bases opposite tip of chin; no groove under tip of snout; eye small, without free margin; dorsal fin origin about 1⅔ to 1¼ head lengths behind anus; anal fin origin close behind anus; both dorsal and anal fins confluent with the small minutely rayed caudal fin; anus farther posteriorly than is usual in echelid eels, only a little in front of the middle of the total length; gill opening a rounded pore on sides; no pectoral fins; lateral line along sides, incomplete, ending a little less than a head length behind anus; lips without cirri; tongue adnate to floor of mouth; teeth short conical, uniserial on maxillary and on dentary, biserial on vomer, and a few teeth on premaxillary far forward, rear margin of eye notably in advance of rictus; anterior margin of eye closer to tip of chin than rictus; snout bluntly pointed.

*Color in alcohol.*—Plain pale, probably whitish when first preserved.

*Remarks.*—This new species differs from all other species of *Muraenichthys* of the Pacific in the combination of dorsal origin far behind a vertical line thru anus, posterior nostrils opening on outside of upper lip below front of eye, and the dentition. It may be separated from other species by means of the key.

## PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

### THE ACADEMY

#### 425TH MEETING OF BOARD OF MANAGERS

The 425th meeting of the Board of Managers, held in the Cosmos Club, February 14, 1949, was called to order at 8:05 P.M. by the President, F. H. H. ROBERTS, Jr. Others present were: F. B. SILSBEE, H. S. RAPPLEYE, N. R. SMITH, H. A. REHDER, ALAN STONE, W. W. DIEHL, W. N. FENTON, C. L. GAZIN, F. D. ROSSINI, C. F. W. MUESEBECK, ALEXANDER WETMORE, W. A. DAYTON, R. S. DILL, MARGARET PITTMAN, H. W. HEMPLE, O. B. FRENCH, F. M. SETZLER, and, by invitation, HERBERT FRIEDMANN, R. W. BROWN, J. L. SHERESHEFSKY, and M. A. MASON.

The minutes of the 424th meeting were read and approved.

The following appointments were announced by the President:

*Appointed Members of Executive Committee:* F. B. SILSBEE and N. R. SMITH.

*Board of Editors of the Journal:* ALAN STONE was designated Senior Editor. F. J. HERMANN was named to replace J. I. HOFFMAN. J. C. EWERS and J. I. HOFFMAN were appointed Associate Editors for terms of 3 years representing, respectively, the Anthropological Society of Washington and the Chemical Society of Washington.

*Committee on Membership:* H. E. MCCOMB (chairman), R. G. BATES, C. A. BETTS, WILBUR BURBANK, W. W. DIEHL, REGINA FLANNERY, C. L. LARSON, C. S. PIGGOT, R. J. SEEGER, H. W. WELLS, C. E. WHITE.

*Committee on Meetings:* HERBERT FRIEDMANN (chairman), G. A. COOPER, F. M. DEFANDORF, C. L. GARNER, F. B. SCHEETZ.

*Committee on Monographs:* To January 1950—R. W. BROWN (chairman), H. A. REHDER. To January 1951—W. N. FENTON, E. W. PRICE. To January 1952—P. H. OEHSER, J. R. SWALLEN.

*Committee on Awards for Scientific Achievement:* W. A. DAYTON (general chairman). *For the Biological Sciences:* W. A. DAYTON (chairman), H. P. BARSS, ELMER HIGGINS, B. J. OLSON, E. W. PRICE, T. D. STEWART, J. S. WADE. *For the Engineering Sciences:* H. G. DORSEY (chairman), R. C. DUNCAN, H. N. EATON, H. W. HEMPLE, W. R. OSGOOD, WALTER RAMBERG, O. W. TORRESON. *For the Physical Sciences:* W. J. ROONEY (chairman), N. L. DRAKE, F. L. MOHLER, P. A. NEAL, M. X. SULLIVAN, J. H. TAYLOR, J. S. WILLIAMS.

*Committee on Grants-in-Aid for Research:* J. L. SHERESHEFSKY (chairman), ANNA E. JENKINS, J. M. COOPER.

*Committee on Policy and Planning:* To January 1950—J. E. GRAF (chairman), F. B. SILSBEE. To January 1951—A. H. CLARK, L. W. PARR. To January 1952—M. A. MASON, J. I. HOFFMAN.

*Committee of Auditors:* L. G. HENBEST (chairman), N. F. BRAATEN, C. V. MORTON.

*Committee of Tellers:* N. M. JUDD (chairman), P. S. CONGER, J. P. E. MORRISON.

The following report of the Executive Committee was presented:

The Executive Committee met in the Cosmos Club at 8:00 P.M., on February 9, 1949, to consider the 1949 Academy budget. Present were: F. H. H. ROBERTS, JR. (chairman), H. S. RAPPLEYE, F. B. SILSBEE, N. R. SMITH, and F. M. SETZLER. After

considerable deliberation, based on the estimated receipts for the year 1949, the Committee unanimously approved the following budget as submitted by the Treasurer and recommended it to the Board of Managers:

| | 1948[1] | 1949 (estimated) |
|---|---|---|
| Dues | $3,726.25 | $3,600.00 |
| Subscriptions | 1,441.62 | 1,500.00 |
| Interest & dividends | 968.50 | 1,000.00 |
| Sale of publications | 176.90 | 175.00 |
| | $6,313.27 | $6,275.00 |

Proposed allotments for the Academy during 1949 as well as a comparison of expenditures for the year 1948:

| | 1948[2] | 1949 (estimated) |
|---|---|---|
| JOURNAL: | | |
| Printing & mailing | $4,950.22 | |
| Illustrations | 569.87 | |
| Reprints | 646.42[3] | |
| Total | $6,166.51 | |
| Less charges to authors | 913.66[4] | |
| Total | $5,252.85 | $6,303.42[5] |
| Ed. asst. & misc. | 350.00 | 350.00 |
| Total for JOURNAL | $5,602.85 | $6,653.42 |
| Secretary | 555.93 | 550.00[7] |
| Treasurer | 247.01 | 300.00[8] |
| Subscrip. Mgr. & C. of Pubs. | 77.64[6] | 50.00 |
| Meetings Committee | 462.98 | 500.00 |
| Membership Committee | 10.51 | 20.00 |
| Science Calendar | 62.10[9] | 10.00 |
| Science Fair | | 100.00 |
| TOTAL | $7,019.02 | $8,183.42 |
| An increase of $1,164.40 | | |
| Less estimated receipts | | 6,275.00 |
| Operating deficit for 1949 | | $1,908.42 |
| Additional obligations due in 1949 | | |
| Estimated cost of Monograph No. 1 | | $2,300.00 |
| Index to JOURNAL—1st payment | | 500.00 |
| Estimated decrease in net worth | | $4,708.42 |

[1] Includes $120 from delinquent dues—not repeatable in 1949.

[2] These figures not in agreement with annual report, since bills paid since January 1, 1949, on 1948 accounts are included here.

[3] December reprints estimated.

[4] December charges to authors estimated.

[5] This exceeds original allotment because of subscription campaign authorized separately.

[6] 1948 cost plus 20 percent.

[7] Practically unchanged despite increased postage and printing costs because of expected savings resulting from use of post cards for meeting notices.

[8] Increase necessitated by need for considerable printing and some increase in postage costs.

[9] Includes $50 for 1948 and $12.10 for 1947.

The Executive Committee also recommended that the Board consider the number of free copies of a monograph that should be given to the author. The Committee suggested that not less than 6 copies and not more than 10 copies be given to the author.

As indicated in the 1949 budgetary item for the office of the Secretary, the Committee unanimously approved the suggestion that in order to save the increase in postage and cost of inserting notices in envelopes, future notices of the Academy monthly meetings be printed on 1-cent postcards (a saving of approximately $106).

The Executive Committee adjourned at 10 P.M.

The Board of Managers approved the Budget for 1949 as recommended by the Executive Committee.

After considerable discussion as to how the Academy might recover the expected decrease in the net worth of the Academy, it was voted to place this matter in the hands of the Committee on Policy and Planning.

The Chairman of the Committee on Monographs recommended that 10 copies of a monograph be given to the author and that the author be permitted to purchase additional copies at a 20 percent discount. This recommendation was adopted by the Board.

The Board approved the use of the penny postcard for the announcements of the Academy meetings.

The Secretary read a communication from KARL F. HERZFELD, past Chairman of the Committee on Awards in the Physical Sciences, in which it was suggested that the present rules be changed from "40th birthday" to "45th birthday." It was voted to refer this matter to the Committee on Policy and Planning.

M. A. MASON, Chairman of the Committee on Encouragment of Science Talent, reviewed the work of the Committee during the past few weeks and recommended (1) that a special certificate of award be prepared to be given to the high-school student or students selected by the Committee; (2) that these awards be given at the regular March meeting of the Academy at which time the Academy presents the Awards for Scientific Achievements; and (3) that the Committee be empowered to select the student winners without prior approval by the Board of Managers. The third item was suggested because of the short space of time between the selection of the winner and the March meeting. The above recommendations were adopted by the Board.

Dr. MASON announced that three subcommittees were being created out of the present standing Committee on Encouragement of Science Talent and that the annual Science Fair would be held from April 1 to April 9 in the Auditorium of the Department of Commerce.

The Board recommended that the Committee on the Index of the Journal be reconstituted for 1949.

Three persons nominated for resident membership at the 424th meeting of the Board of Managers were elected.

C. O. APPLEMAN and PAUL BARTSCH were transferred to the retired list of members, effective December 31, 1948, and L. A. ROGERS was transferred to the retired list effective December 31, 1949.

The Secretary reported the following deaths: JOSEPH A. AMBLER, Southern Regional Research Laboratory, U. S. Department of Agriculture, on October 6, 1948 (elected April 10, 1925); and EDWARD R. STITT, Rear Admiral (Retired), Washington, D. C., on November 13, 1948 (honorary member, elected March 5, 1939).

The meeting was adjourned at 9:50 P.M.

### 426TH MEETING OF BOARD OF MANAGERS

The 426th meeting of the Board of Managers was held in the Cosmos Club on March 14, 1949. The meeting was called to order at 8:03 P.M. by the President, F. H. H. ROBERTS, Jr. Also present were: H. S. RAPPLEYE, N. R. SMITH, ALAN STONE, F. G. BRICKWEDDE, W. W. DIEHL, W. N. FENTON, W. F. FOSHAG, F. D. ROSSINI, J. B. REESIDE, Jr., F. A. WEISS, R. S. DILL, MARGARET PITTMAN, H. W. HEMPLE, H. G. DORSEY, O. B. FRENCH, F. M. SETZLER, and, by invitation, H. E. MCCOMB, H. FRIEDMANN, R. W. BROWN, J. L. SHERESHEFSKY, and M. A. MASON.

The minutes of the 425th meeting were read and approved.

The President announced that he had reconstituted the 1948 Committee on the Index of the Journal, consisting of W. N. FENTON (chairman), J. I. HOFFMAN, M. C. MERRILL, P. H. OEHSER, and H. A. REHDER.

The chairman of the Committee on Membership, H. E. MCCOMB, presented 11 resident and 1 non-resident nominations for membership.

The Committee on Policy and Planning made the following recommendations: (1) That there be no change made in the present age requirement for the Academy Awards; (2) that the publication of the 4-page insert listing officers of the Academy and Affiliated Societies be omitted. The Board unanimously approved the above recommendations.

The Chairman of the Committee on Science Talent, M. A. MASON, presented the following report:

The Committee on Encouragement of Science Talent has examined the records of the 29 local contestants in the National Science Talent Search conducted by the Westinghouse Educational Foundation and Science Service. The Board of Judges of the national search selected two national winners and two honorable mention contestants from this group. In compliance with our agreement with Science Service as a sponsor we were required to name these four contestants as local winners.

The Committee considered the records of those contestants not selected on a national basis and concluded that three additional local contestants had demonstrated science talent worthy of recognition by the Academy. It is the opinion of the Committee that the number of local winners selected should not establish a precedent, it being felt that the demonstration of science talent worthy of recognition should be the principal criterion of selection.

The Committee, as a result of its study, recommended the following persons to receive the Certificate of Merit of the Academy:

WALTER GILBERT, for science talent demonstrated by his study of the one-step separation of zirconium and hafnium. (3309 Thirty-fifth Street, NW., Washington 16, D. C., age 16, Sidwell Friends School.)

CARL WEBER WERNTZ, for science talent demonstrated by his observation of variable stars. (620 Nicholson Street, NW., Washington 11, D. C., age 17, Calvin Coolidge High School.)

AGNES SCOTT PRESTON, for science talent demonstrated by her studies in chemotherapy. (1523 P Street, NW., Washington 5, D. C., age 17, Dunbar High School.)

JOHN RICHARD MCGONEGAL, for science talent demonstrated by his studies of the applications of radioactive substances in chemistry. (4524 South Dakota Avenue, NE., Washington 17, D. C., age 16, St. Anselm's Priory High School.)

ELLEN MAE MACEWEN, for science talent demonstrated by her experiments in chemiluminescence. (4825 Montgomery Lane, Bethesda 14, Md., age 17, Woodrow Wilson High School.)

CHARLES EDWARD WEIR, for science talent demonstrated by his studies of audio frequency filters. (1206 Kearny Street, NE., Washington, D. C., age 15, Dunbar High School.)

WILLIAM STANTON SHIPLEY, for science talent demonstrated by his experiments with high speed automobile engines. (4311 Brandywine Street, NW., Washington 16, D. C., age 17, Woodrow Wilson High School.)

The Committee further recommended that the Secretary of the Academy be authorized to send a letter of recommendation for each of the above to the college or university of their choice, indicating that they are recipients of the Academy's Certificate of Merit and that they are considered worthy of consideration for scholarship awards by the college or university.

The Board unanimously accepted the recommendations in the above report and offered a vote of thanks to the Committee.

P. L. RICKER, having retired from the gainful practice of his profession, was transferred to the retired list of membership effective December 31, 1948.

The Secretary reported the death of the following members: STEPHEN R. CAPPS, U. S. Geological Survey, on January 19, 1949 (elected December 4, 1914); S. H. MCCRORY, U. S. Department of Agriculture, on February 18, 1949 (elected May 17, 1937); and BAILEY WILLIS, original member, 1898, formerly of the U. S. Geological Survey, on February 19, 1949.

The Senior Editor, ALAN STONE, notified the Board that under the new publishing contract with Waverly Press, Inc. the Academy could obtain 100 four-page reprints for $2.48, whereas the previous publishing company charged $2.40 for 50 four-page reprints. Moreover, Waverly Press, Inc., will not furnish less than 100 reprints. On this basis, Dr. Stone recommended that in the future authors of obituaries should be granted 100 reprints instead of the customary 50 reprints. The Board approved this recommendation.

The President read a letter from J. I. HAMBLETON, Division of Bee Culture, Bureau of Entomology and Plant Quarantine, requesting the Academy to sponsor an illustrated lecture by Dr. KARL VON FRISCH. Mr. Hambleton indicated that Dr. von Frisch was an excellent speaker and would be willing to give a lecture in Washington. Mr. Hambleton also stated that he would be willing to defray the necessary expenses in bringing Dr. von Frisch to Washington. He had also arranged for the use of the auditorium in the U. S. National Museum for Friday evening, April 15. After some discussion the Board voted to sponsor the von Frisch lecture if it were possible for the chairman of the Meetings Committee to arrange with the speaker scheduled for the regular April meeting of the Academy to present his lecture in May, and that the customary expense be assigned to the April 15 meeting. It was also hoped that one or more of the Affiliated Societies would join with the Academy for the von Frisch lecture.

The President read a communication from the American Documentation Institute. It was recommended that this matter be turned over to the Committee on Policy and Planning.

The meeting was adjourned at 9:45 P.M.

F. M. SETZLER, *Secretary.*

## ANTHROPOLOGICAL SOCIETY

The Anthropological Society of Washington at its annual meeting on January 18, 1949, elected the following officers; President, W. MONTAGUE COBB; Vice-President, GORDON R. WILLEY; Secretary, MARSHALL T. NEWMAN (reelected); Treasurer, MARGARET C. BLAKER; Councilors to the Board of Managers, E. WYLLYS ANDREWS IV (reelected), STELLA L. DEIGNAN (reelected), WILLIAM H. GILBERT, Jr., CARL F. MILLER, EUGENE C. WORMAN, Jr.; Representative to the Washington Academy of Sciences, WILLIAM N. FENTON.

A report of the membership and activities of the Society since the last annual meeting follows:

Life members, 1; Active members, 71; Associate members, 15; Total, 87. This represents an increase of four since last year.

The members elected during the year were: Active members: Mrs. MARGARET C. BLAKER, Dr. CORNELIUS J. CONNOLLY, Dr. STELLA L. DEIGNAN, Dr. EDWARD A. KENNARD, D'ARCY MCNICKLE, CARL F. MILLER, BERTRAM L. PEAR, Miss LAVERNA PENDLETON, Mrs. BETTY U. RANDALL, Dr. HENRY L. SMITH, Jr., Mrs. MARION L. VANDERBILT. *Associate members:* ROBERT C. COOK, Dr. LOWELL H. HATTERY, Dr. ROBERT R. SOLENBERGER.

The Society records its deep sense of loss at the deaths of FRANK B. NOYES, a member since 1939, and Dr. RUTH BENEDICT, a member while in Washington during the war.

The report of the Treasurer follows:

*Income:*

| | |
|---|---|
| A.S.W. dues collected | $95.00 |
| Interest, Perpetual Building Association | 59.11 |
| Dividends, Washington Sanitary Improvement Co. | 21.00 |
| Dividends, Washington Sanitary Housing Co. | 12.00 |
| Interest, U. S. Savings Bond | 12.50 |

| | | |
|---|---|---|
| Issuance 21 additional shares of capital stock (@ par value $10) by Washington Sanitary Improvement Co. | 210.00 | |
| Sale of Old Series *Anthropologists* | 47.00 | |
| | | $456.61 |
| *Expenditures:* | | |
| A.A.A. dues paid for Secretary, Treasurer, and 1 life member | 15.00 | |
| Expenses, speakers | 4.70 | |
| Incidental meeting expenses | 41.75 | |
| Printing and mailing notices | 48.08 | |
| Authorized from President's contingent fund | 10.53 | |
| Miscellaneous expenses, Secretary and Treasurer | 16.19 | |
| A.S.W. share, Science Calendar Service | 5.00 | |
| Authorized by Board of Managers | 25.00 | |
| Dues, Inter-American Society of Anthropology and Geography | 3.00 | |
| | | 169.25 |
| Balance | | $287.36 |
| *Assets:* | | |
| Funds invested in Perpetual Building Association | $2,000.00 | |
| 42 shares Washington Sanitary Improvement Co. (par value $10 per share) | 420.00 | |
| 2 shares Washington Sanitary Housing Co. (par value $100 per share) | 200.00 | |
| U. S. Savings Bond, Series G | 500.00 | |
| Cash in bank | 295.51 | |
| Total as of December 31, 1948 | | $3,415.51 |
| Total as of December 31, 1947 | | 3,128.15 |
| Increase | | $ 287.36 |
| Less Bills outstanding: | | |
| To A.A.A. (Subscription to American Anthropologist) For 1 member, 2 years, 1949–50 | | 10.00 |
| Net increase | | $277.36 |

Except for the program of November 17 at the Cosmos Club, all regular meetings were held at the U. S. National Museum. The programs for the first part of the year were arranged by the Secretary; for the second part of the year, by a program committee comprising Dr. GORDON R. WILLEY (chairman) and Dr. GEORGE M. FOSTER.

Titles of papers presented before the regular meetings of the Society were:

January 7, 1948, 747th meeting, N. DATTA-MAJUMDER, *The dynamics of Santal culture: A study in culture change.*

February 4, 1948, 748th meeting, JOHN PROVINCE, *Current trends in Indian affairs.*

March 3, 1948, 749th meeting (in conjunction with 15th James Arthur Annual Lecture on the Sun), HERBERT J. SPINDEN, *Mexican calendars and the solar year* (slides).

April 7, 1948, 750th meeting, REGINA FLANNERY, *A Plains Indian individualist.*

May 5, 1948, 751st meeting, R. M. TATUM, *Distribution, analysis, and chronology of petroglyphs in the United States.*

October 19, 1948, 752d meeting, DAVID C. GRAHAM, *The customs and religion of the Lolos, or Fighting with magic.*

November 17, 1948, 753d meeting, EDWARD A. KENNARD, *Anthropology and the Foreign Service* (at Cosmos Club; refreshments served by the Society).

December 21, 1948, 754th meeting, HENRY LEE SMITH, Jr., *Language and culture.*

The Society was able to increase its program budget from $105 in 1948 to $190 for 1949. After considering the American Anthropological Association's proposal to do all billing for its affiliated societies, a special committee reported its findings to the membership. This report was also forwarded to the Executive Board of the A.A.A. for its consideration at the December 1948 meetings.

MARSHALL T. NEWMAN, *Secretary.*

# Obituaries

STEPHEN REID CAPPS.—It is my sad duty to bring to the formal attention of the Washington Academy of Sciences the sudden termination of the career of one of its long-time members and a former president of the Geological Society of Washington, Dr. Stephen Reid Capps, who was born on October 15, 1881, and died on January 19, 1949.

First and foremost, Dr. Capps was always at heart a field geologist. The endless "pushing around" of papers, which unfortunately engulfs the activities of most administrative positions, was always anathema to him, and time after time he chose some arduous field assignment rather than take on duties that would keep him submerged in desk work. He, however, was not one to shirk responsibility, and in his later assignments, when it became necessary for him to devote more and more of his time to administrative duties, he would buckle down to the inevitable desk work with the same determination as he would have approached a particularly boggy portion of his route across an unexplored country, determined to carry out the assignment to the best of his ability.

Much of his success in his field work came through his interest and curiosity regarding all aspects of nature. To him, not only did the different rocks have a story to tell, but so also did each change in the slope of a hillside or the character of the vegetation associated with the different land forms and the materials of which they were built or the animals that ranged in the different parts of the terrane.

Although far from appearing to have a rugged physique—he was slender and over 6 feet 4 inches tall—few could outlast him in getting over ground in the field, and no matter how stiff had been his scrambles and climbs during the day, as a young man he was never too tired to take additional tramps afield to see whether he could not get a mess of fish, or some game, or examine some object that piqued his curiosity. His deftness in using his hands was a constant asset to him whether that skill was utilized in the field, in building a boat in which his party could cross a turbulent stream, in repairing gear, or in devising some gadget that would serve to amuse or be a convenience to his associates. This same skill enabled him, in his leisure hours at home, to fill his house with furniture masterpieces which he built—often from the very start of whipsawing a log into the needed planks.

From the University of Chicago in 1907 he received the Ph.D. degree for his studies of ancient glaciation in the mountains of Colorado. He was first employed by the United States Geological Survey on investigations of water-supply problems in the Central States. Soon, however, he transferred to Alaskan explorations, in which he made notable contributions during the next 28 years. It was during this period that he built a national and international reputation as a reconnaissance geologist, especially adept in the interpretation of phenomena attendant on existing and ancient glaciation and its effect on the sculpture of land forms. He put this great ability to continued national service in his examination of many of the mineral bearing localities in the Territory, notably the gold lodes and placers of the Willow Creek, Yentna, and Kantishna districts, of the coal deposits of the Bonnifield district and adjacent parts of the Alaska Range, and of the copper deposits of the Prince William Sound region and parts of the Copper River region.

His ability as a reconnaissance geologist led to his being selected to carry out certain of the investigations of the petroleum resources of the Alaska Peninsula region and to serve as special consultant to the expedition that was sent out by the Navy to examine extensive tracts in the Aleutian Islands. This special competency undoubtedly was the reason why, in 1920 and in 1922, he was employed by a private commercial company to conduct extensive explorations for petroleum in Palestine and adjacent areas in the Near East.

His monumental compendium on the *Geology of the Alaska Railroad region* (U. S. Geol. Surv. Bull. 907) gave him a remarkable opportunity to demonstrate his broad knowledge and ability to coordinate a tremendous body of material by bringing together and summarizing not only his own explorations in different parts of that area, but also to synthesize and present as a unit all of the work that had been done by others during more than half a century of endeavor in that particularly difficult tract which lies athwart the general trend of geologic structures in central-southern and parts of interior Alaska.

Perhaps overemphasis has been given to Capps's Alaska work, because the results have

been made public through his printed reports, and therefore are freely available. Much of his later work was concerned with investigations the results of which have not yet been made widely accessible, or were of an administrative character that do not lend themselves to discussion. Suffice it to say that these studies led him, as a member of the Geologic Branch, to investigate critically, in the field, certain of the mineral bearing areas in Idaho and Colorado, in the United States, as well as extensive deposits of manganese, in Brazil.

From time to time, in his later years, as a member of the Survey group working on problems of Military Geology, he prepared numerous confidential memoranda and reports on various foreign and domestic sources from which the nation could obtain needed materials for the successful prosecution of this country's global war or defense programs. Advice of value that he could furnish to the military agencies of the government was not restricted solely to war materials, but included highly classified strategic subjects that could be best analyzed by a geologist, and for which Capps had special fitness.

Constantly called on to assist in many of the major projects in which the Geologic Branch of the Survey became involved, he was one of the leaders of the group whose technical advice and council were utilized in contributing to the broad planning for the great projects lately under way which looked forward to the development of the whole Missouri Valley region. During 1946–1947 he was engaged primarily in planing the Geological Survey's part in the great reclamation projects which involved not only the Missouri Valley but also the Columbia, Colorado, and the Central Valley of California. This called not only for the highest type of professional insight but also for capacity to coordinate and work with others who approached the problems from diverse and often adverse viewpoints.

High as Capps was rated as an eminent geologist, he was rated even higher as a man and a friend. Witty, stimulating, along whatever line his versatile brain turned, he was never reluctant to express his views, but was never militant in so doing. He was ever ready to befriend all whom he could help. He left an ineradicable impression on those with whom he came in contact and enduring contributions to the science to which he devoted his great talents.

PHILIP S. SMITH.

SAMUEL HENRY MCCRORY was born in Iowa City, Iowa, on May 5, 1879, to Charles Robert and Ruth Ann (Stevenson) McCrory. In 1904 he graduated from the State University of Iowa with the degree of B.S. in civil engineering. Twenty-two years later the honorary degree of A. E. (agricultural engineer) was conferred upon him by Iowa State College in recognition of his outstanding work in that field.

In 1907, following a short period in private practice at Sioux City, Iowa, he entered Government Service as instrument man in the irrigation and drainage investigation branch of the Office of Experiment Stations of the United States Department of Agriculture. His work at first had to do with the development of plans for farm and community drainage and for flood protection. He rapidly passed through the various grades of the organization until in 1913 he was appointed chief of the division of drainage investigations. During the ensuing years the scope of his responsibilities was gradually increased until the work under his direction was directed toward research in drainage, erosion control, farm machinery, and farm structures. In 1925 his organization became the division of agricultural engineering in the Bureau of Public Roads. By 1935 the work of his division had grown to such an extent as to justify bureau status, and the Bureau of Agricultural Engineering, with Mr. McCrory as chief, was established in the Department of Agriculture.

During World War II he served as director of the hemp division of the Commodity Credit Corporation of the Department of Agriculture, supervising the construction of about 40 hemp plants in this country. After 40 years in the Department of Agriculture he retired in 1947.

His contributions to agricultural engineering have been widely acclaimed. Not only was he the first recipient of the John Deere Gold Medal (in 1938) but was also made president of the American Society of Agricultural Engineers and life member of the American Society of Civil Engineers and the Washington Society of Engineers.

Samuel McCrory married Blanche Severe in Sioux City, Iowa, on June 30, 1909. They had two daughters, Dorothy Emogene and Ruth Roberta. It was shortly after his return from a mission for the Government to Egypt, Palestine, and countries of Asia Minor and visiting Ruth at her husband's diplomatic post in Italy that Mr. McCrory was suddenly stricken with a heart attack at his Washington home, 6811 Sixth Street, N.W. He died February 18, 1949.

Samuel McCrory was a lovable character having a wide circle of friends. He had belonged to the Washington Academy of Sciences since 1937 and was a member of the Cosmos Club.

C. A. BETTS.